

209020-20889001

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108-127USA000

JCS26 U.S. PTO

10/068803

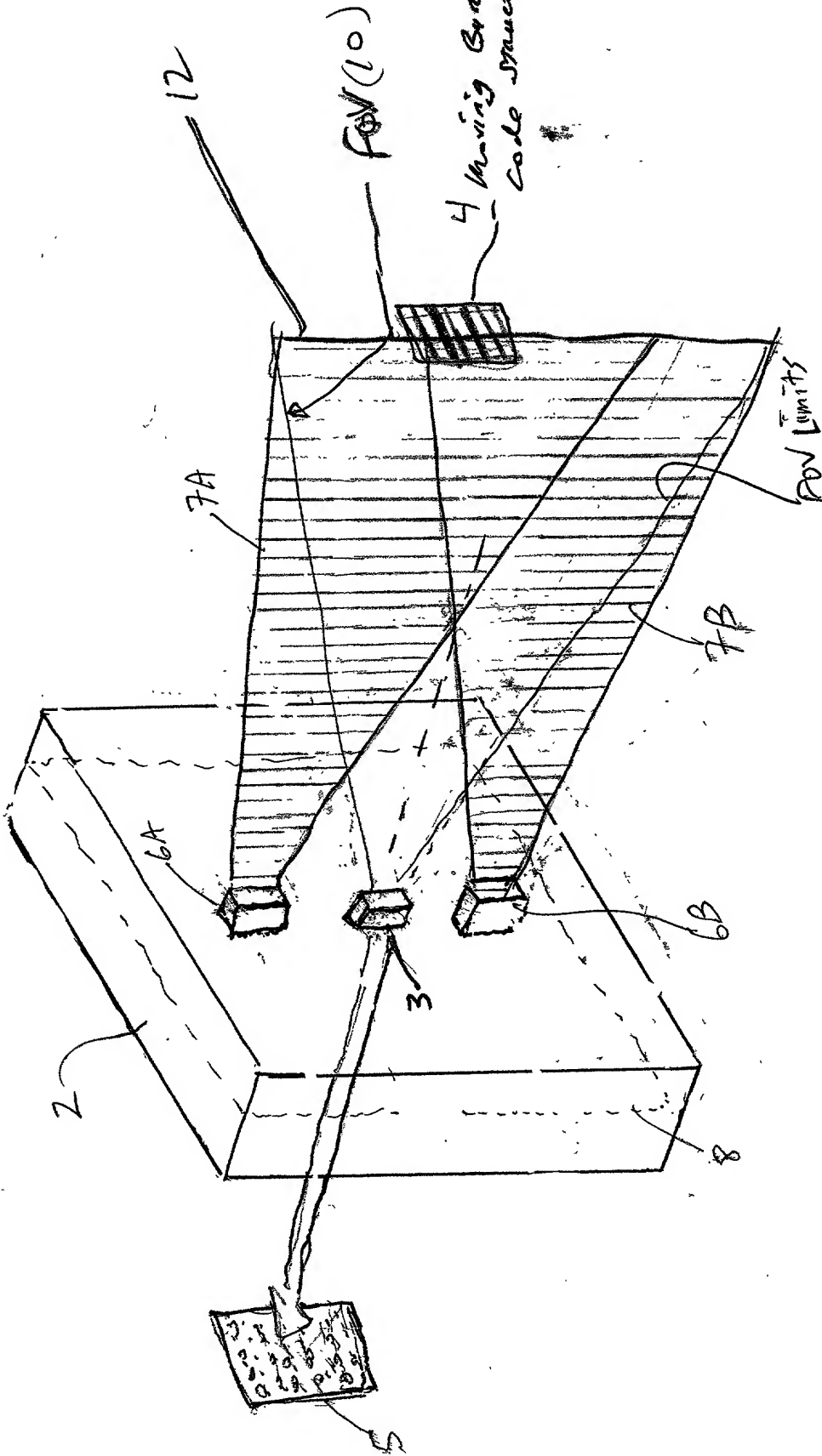
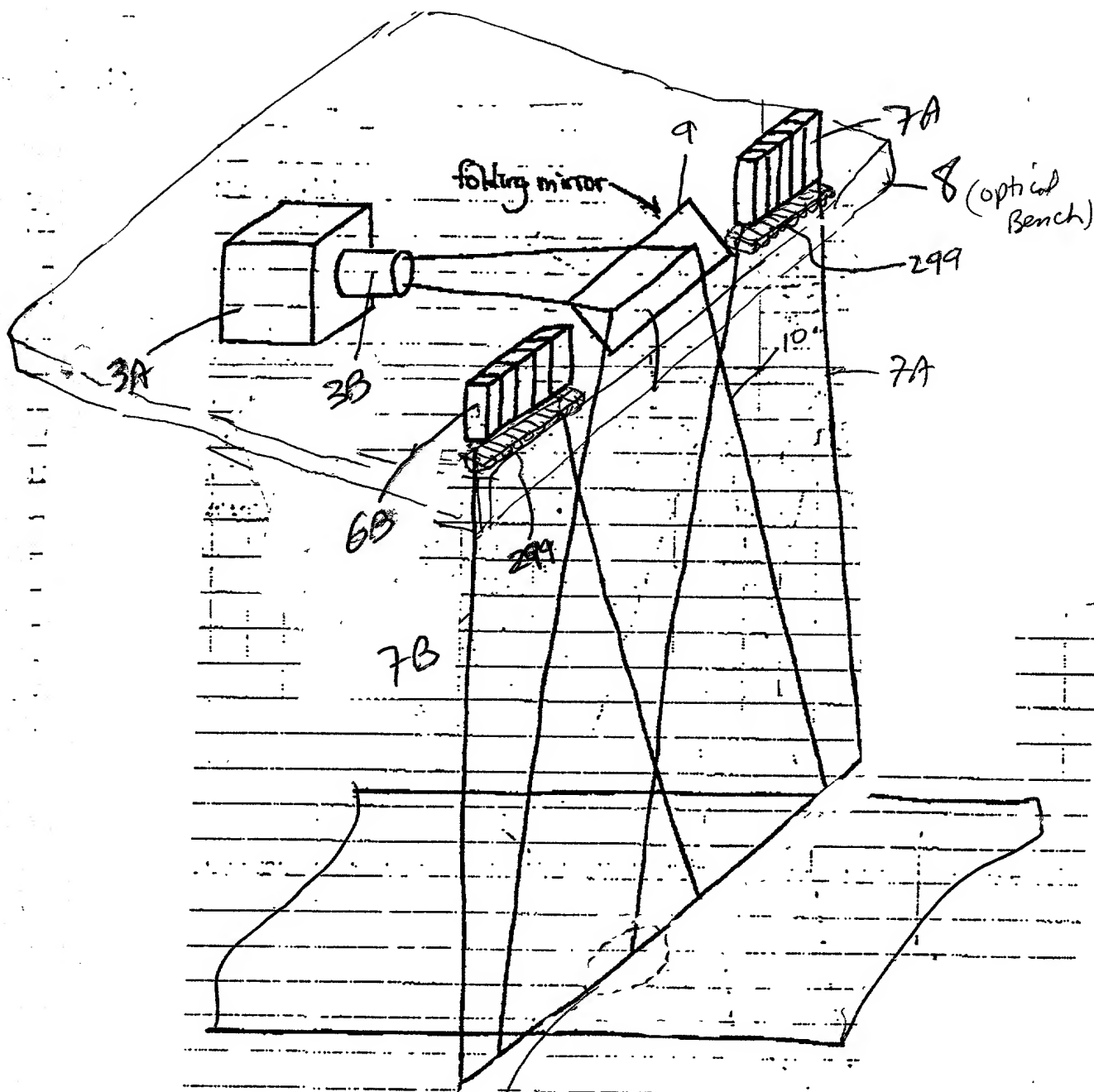


FIG 1A



↑
1A

FIG. 1B1

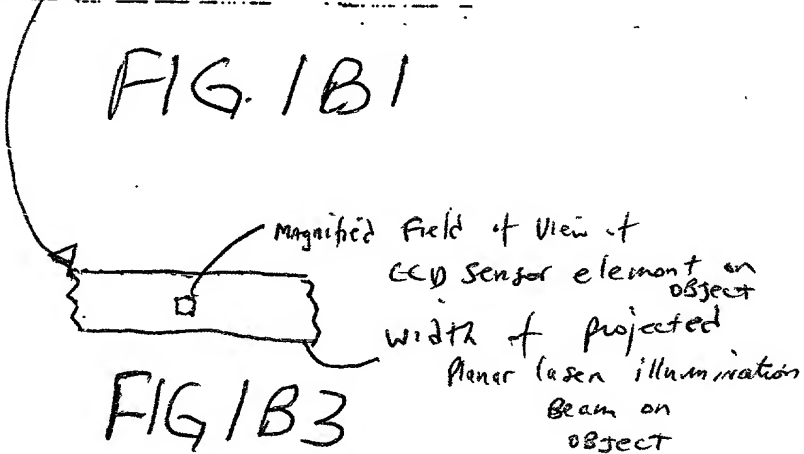


FIG. 1B3

- (1) Fixed focal length camera lens
- (2) Fixed ~~fixed~~ distance

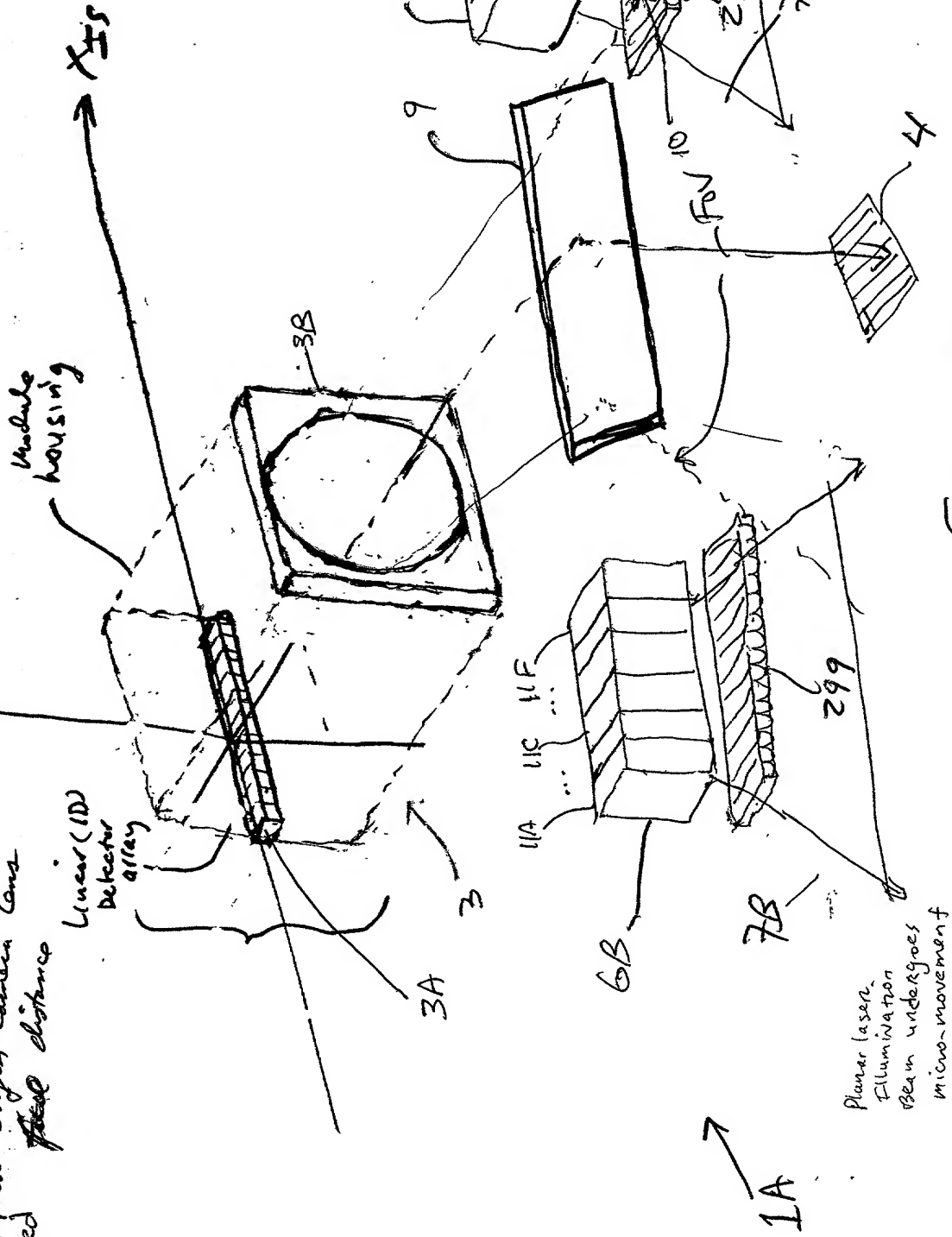
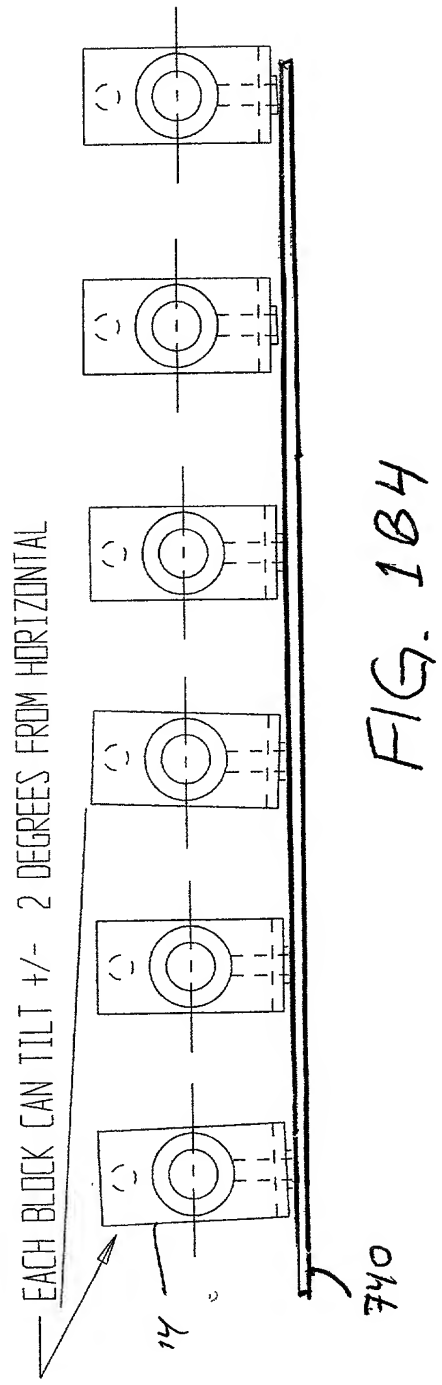
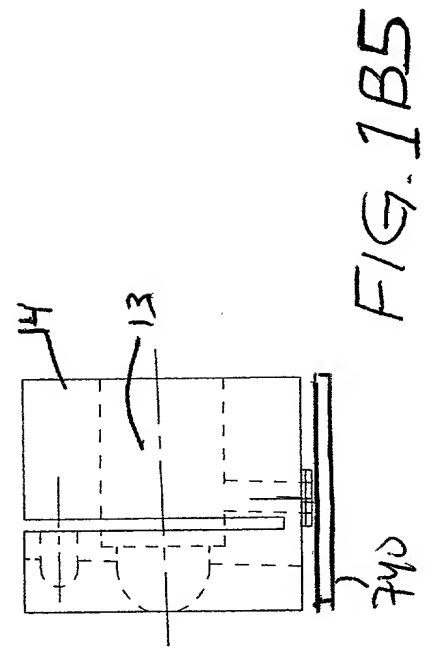


FIG. 1B2

200020-000000T



VLD BLOCK CAN PITCH FORWARD FOR ALIGNMENT WITH OTHER VLD BEAMS



21. 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 <

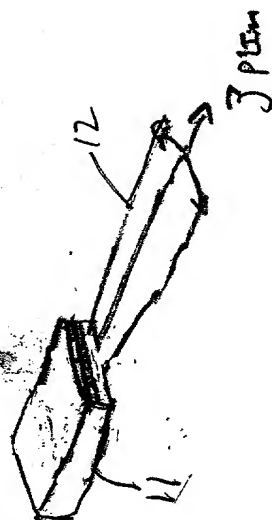


FIG. 1C

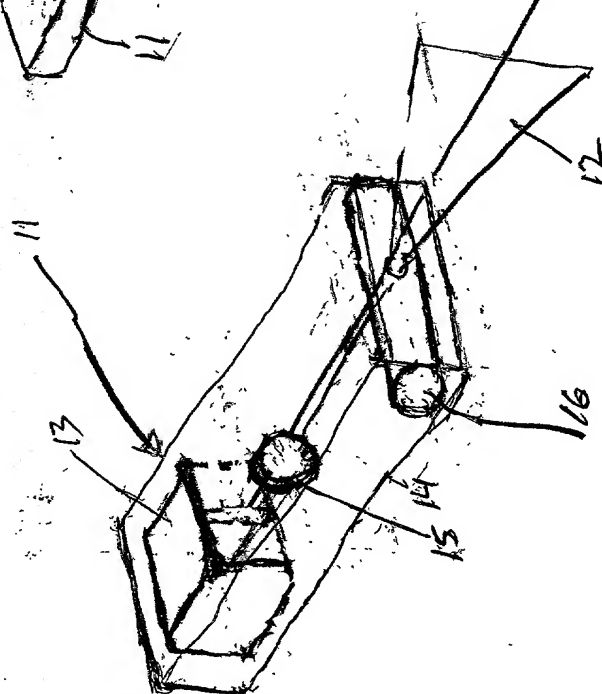


FIG. 1D

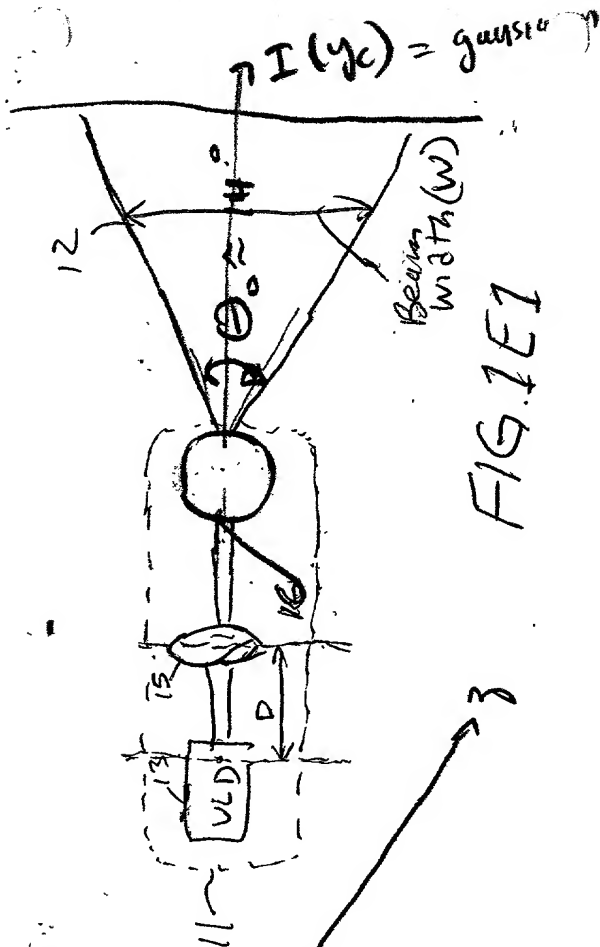


FIG. 1E1

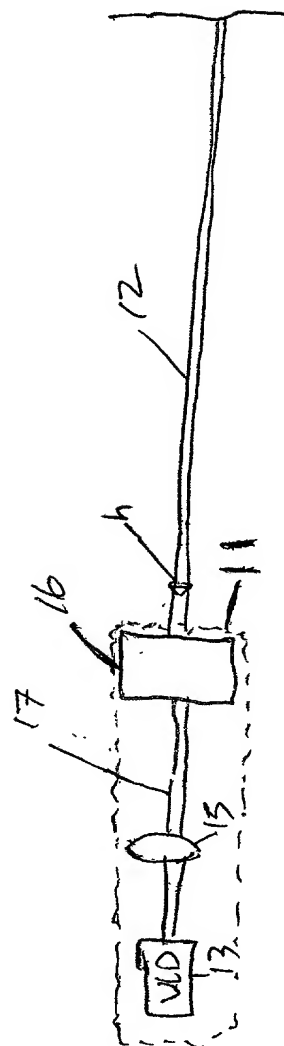


FIG 1E2

maxima	object	range
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200020-0089900
Fixed focal length / Fixed focus distance

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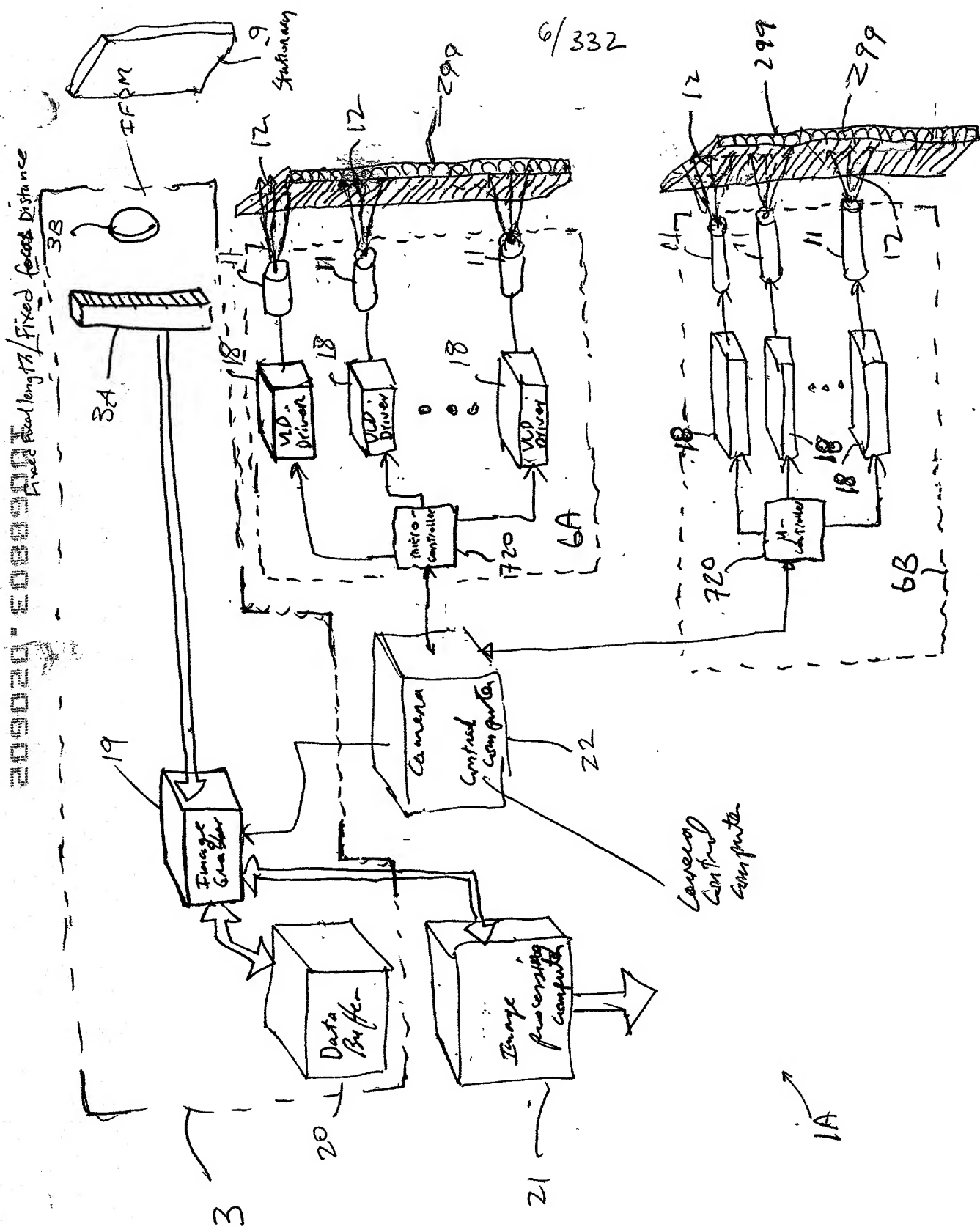
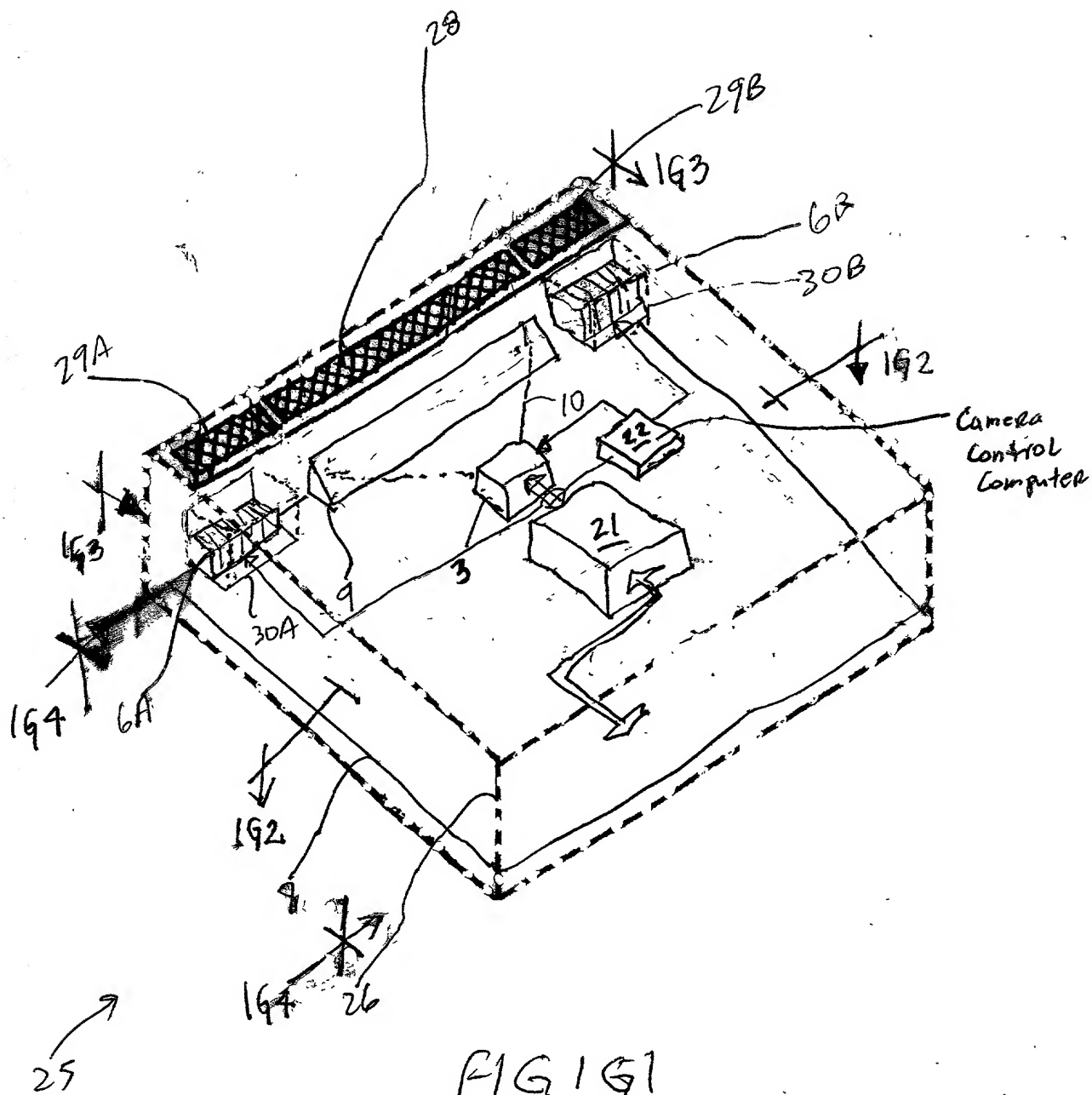


FIG. 1F

20090201E08899001



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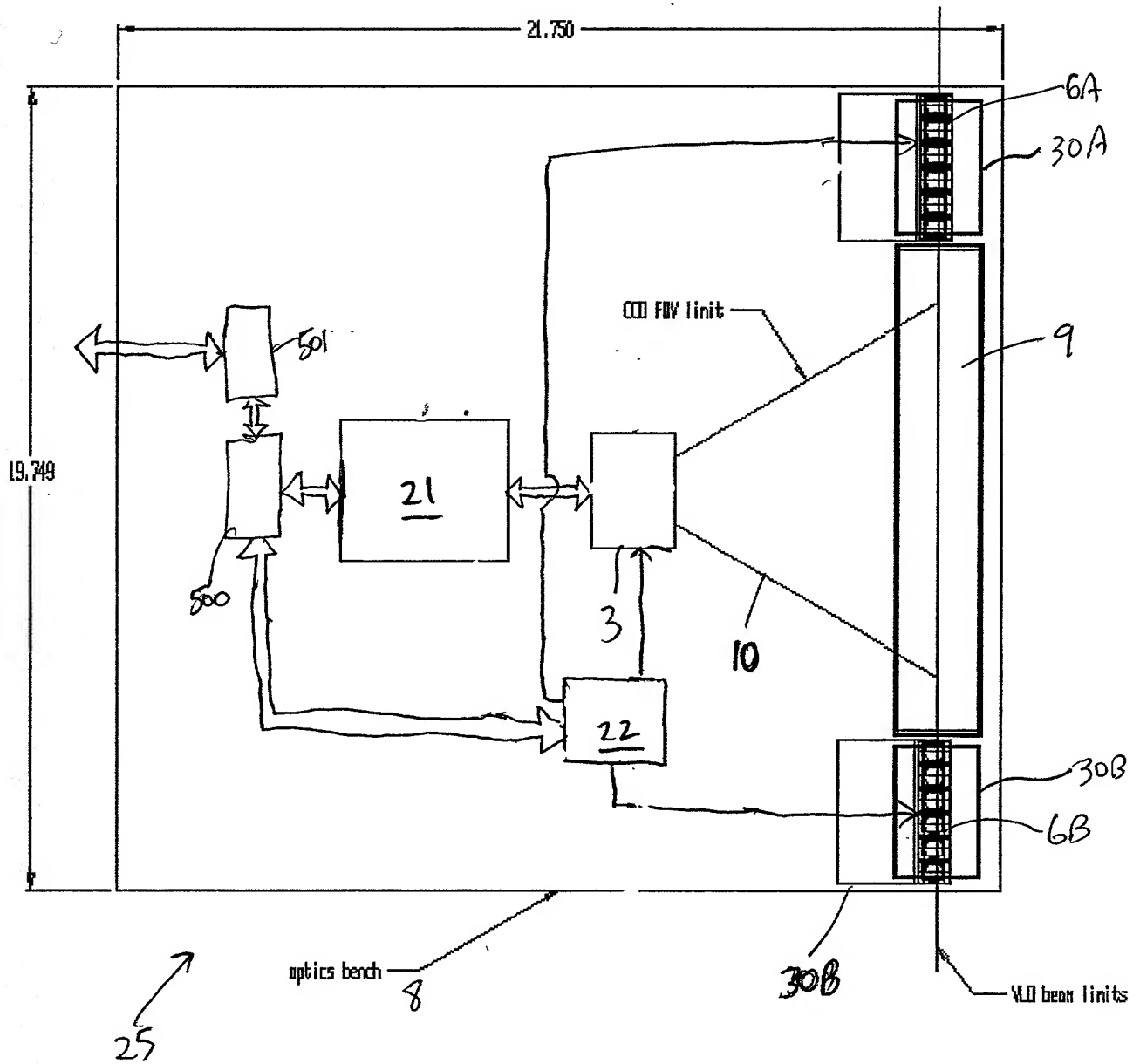


FIG. 142

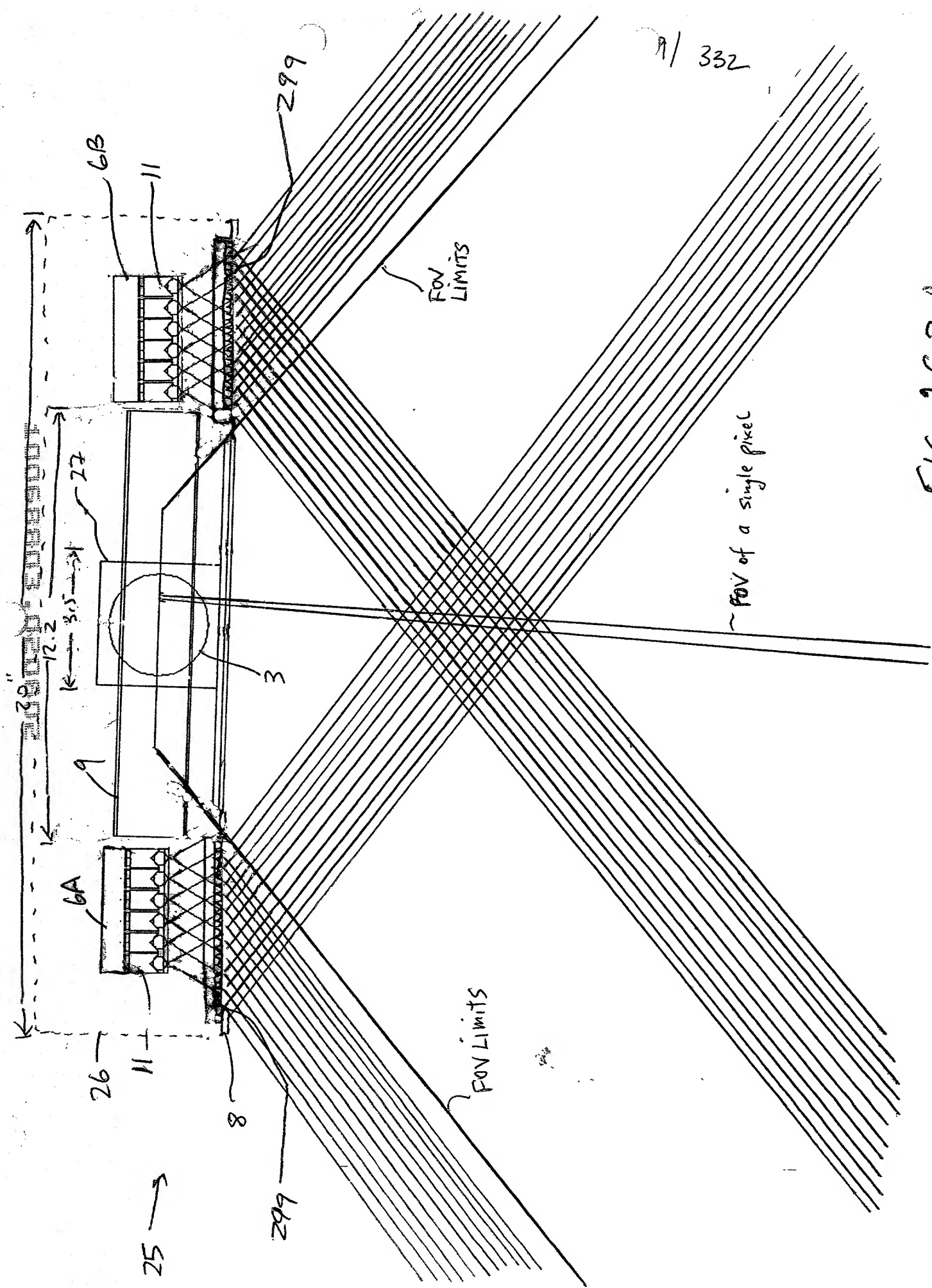
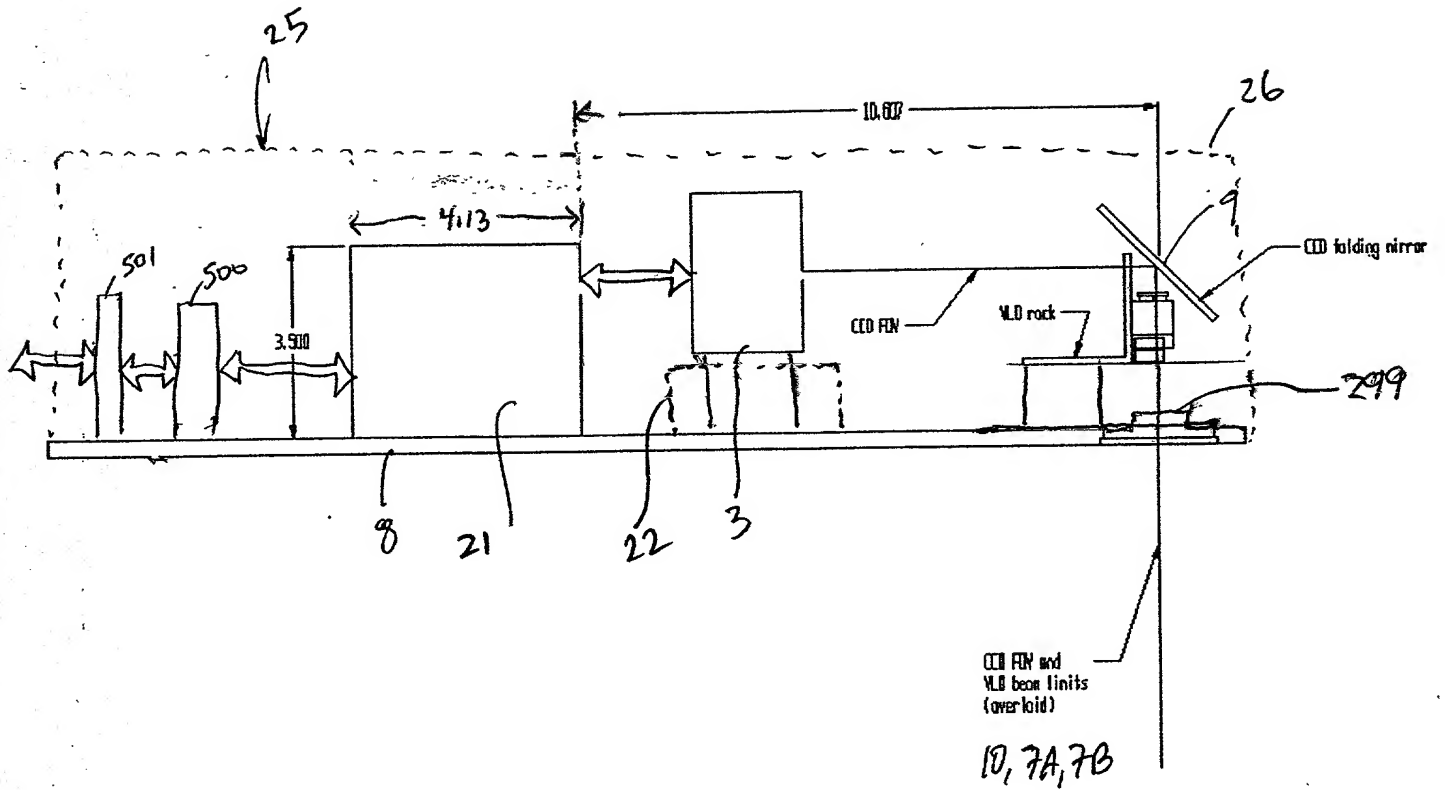


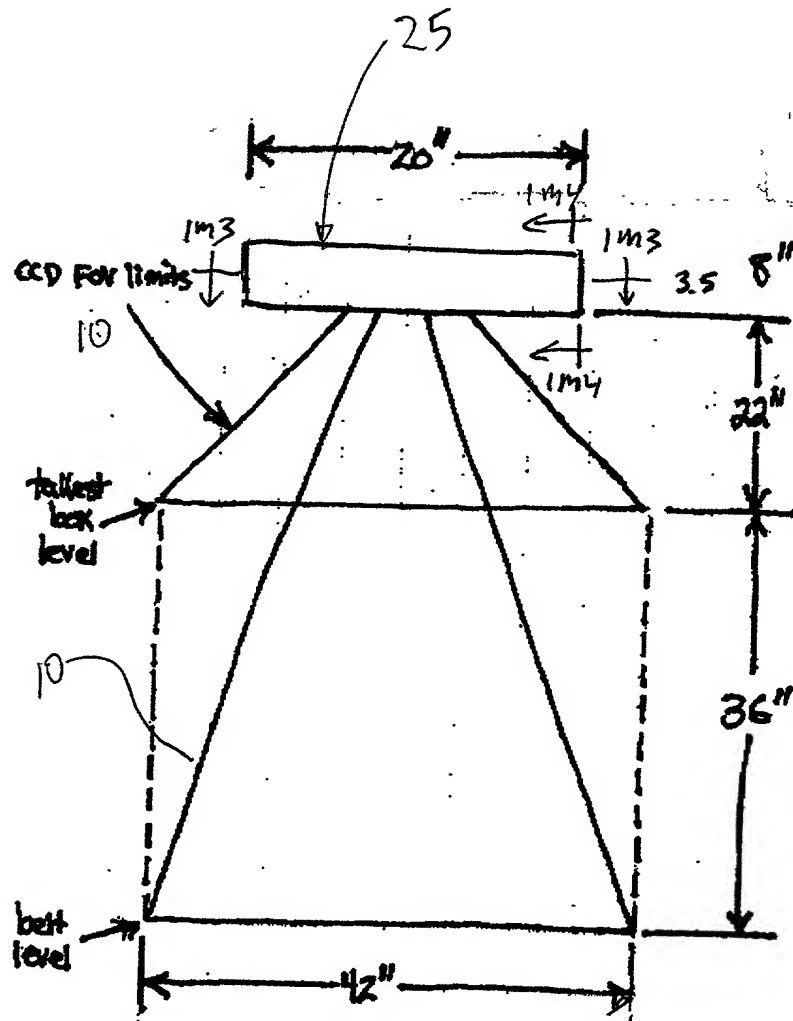
FIG. 1G3

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10066803.020602

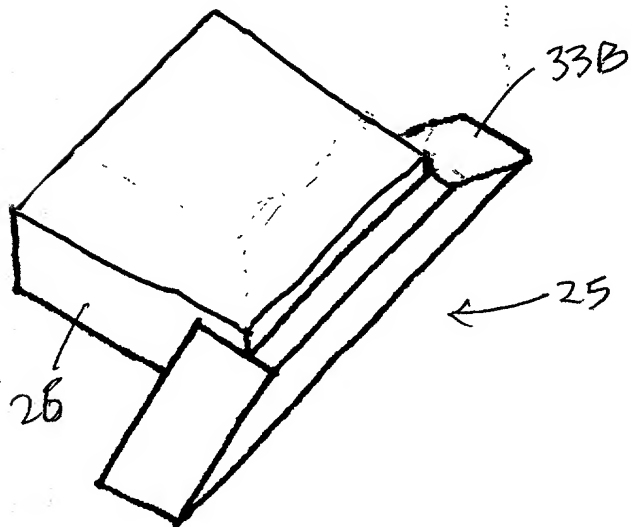
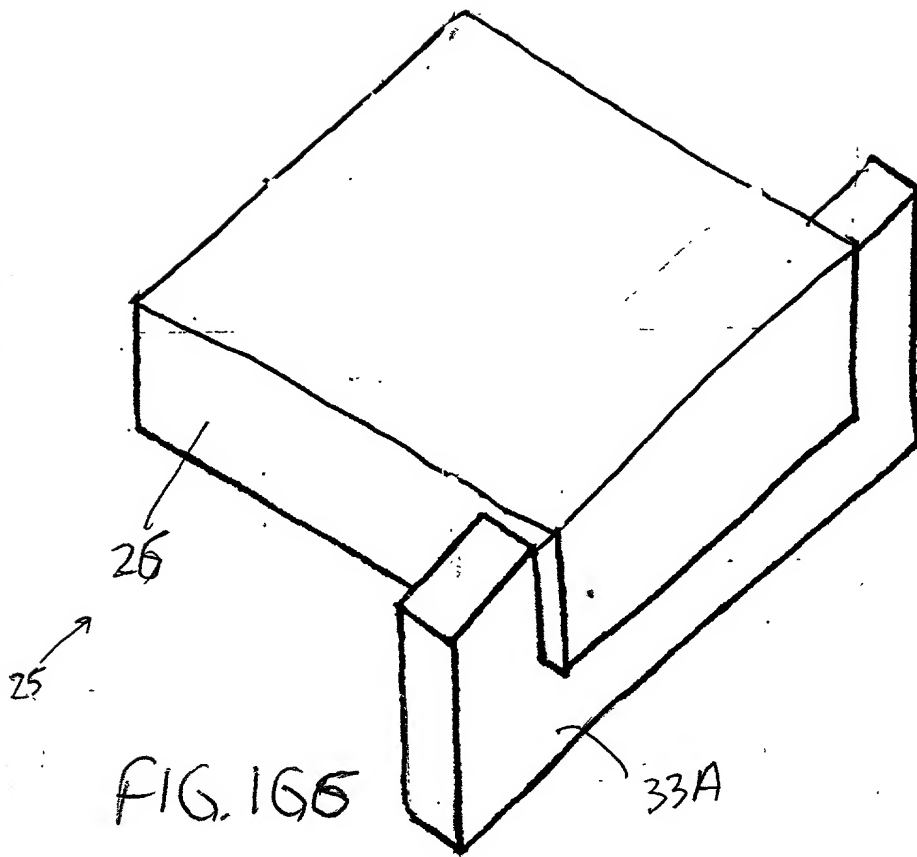


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* Fixed Field of Field

FIG. 1G5



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6A, 6B

32A

32B

FIG. 1G.8

14 L bracket 16 13 14B

VLD sticking out of block

13

32A

2.000"

32B

2.000"

14 block

cylindrical lens 16

FIG. 1G.9

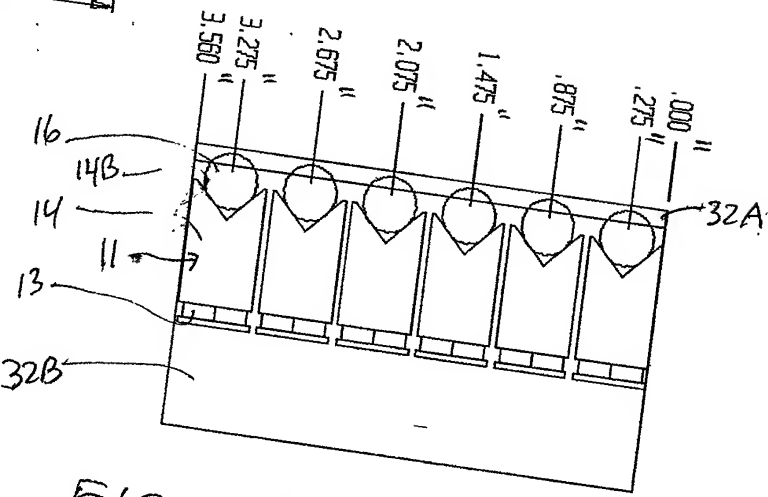
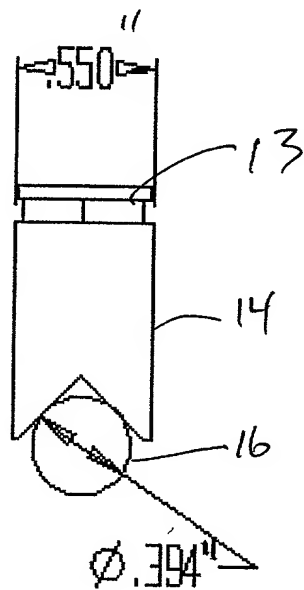
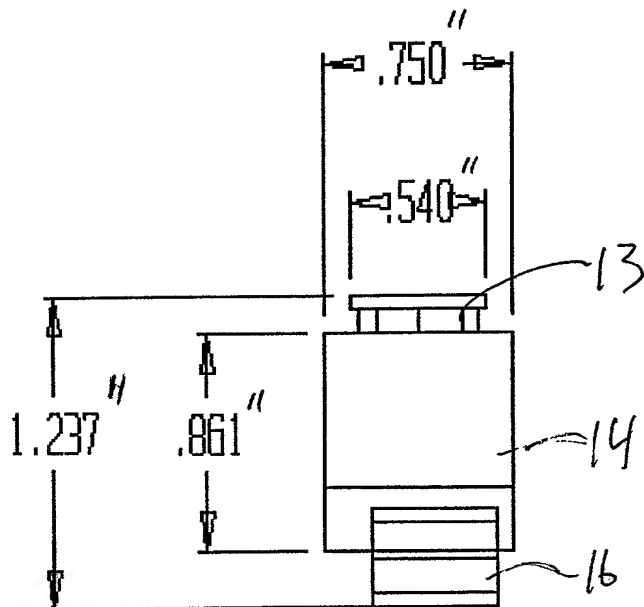


FIG. 1G.10



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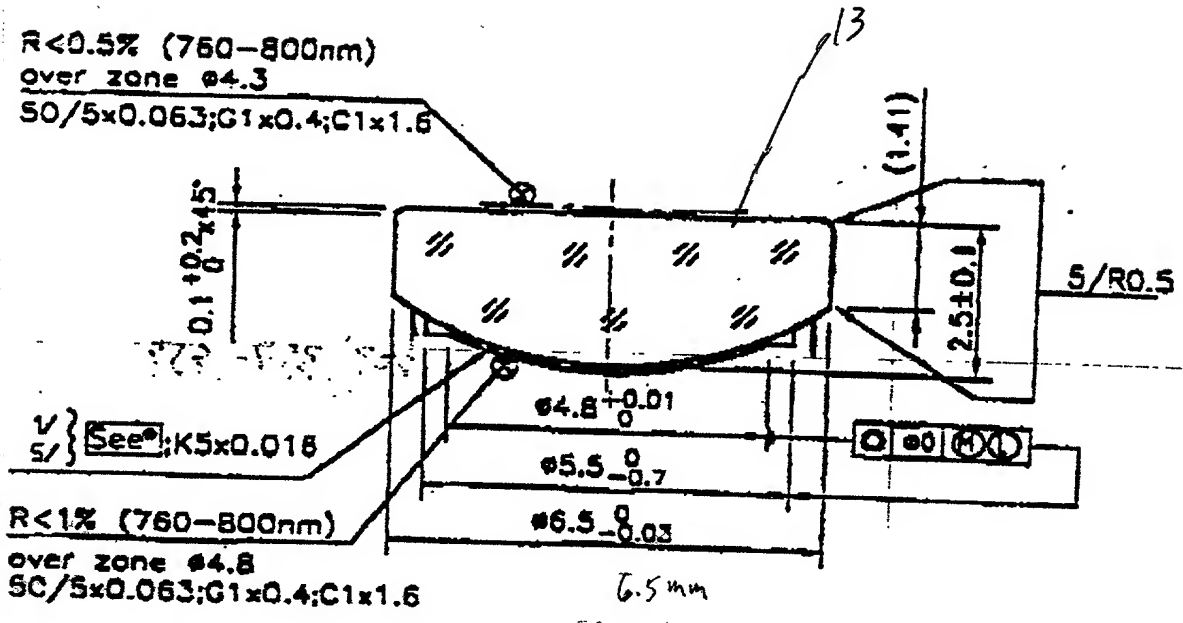


FIG. 1G13

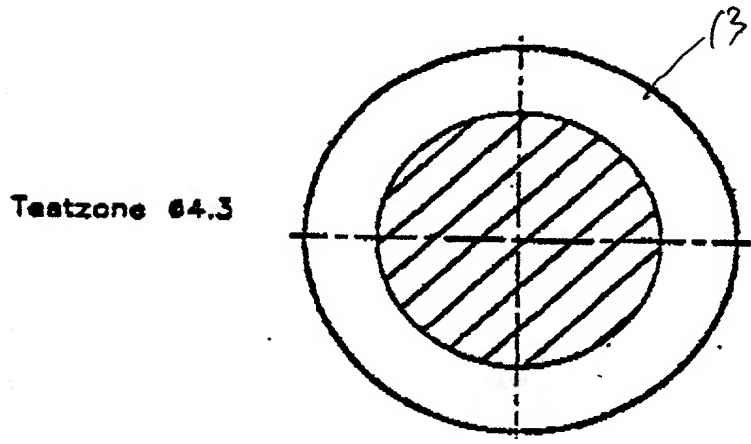


FIG. 1G14

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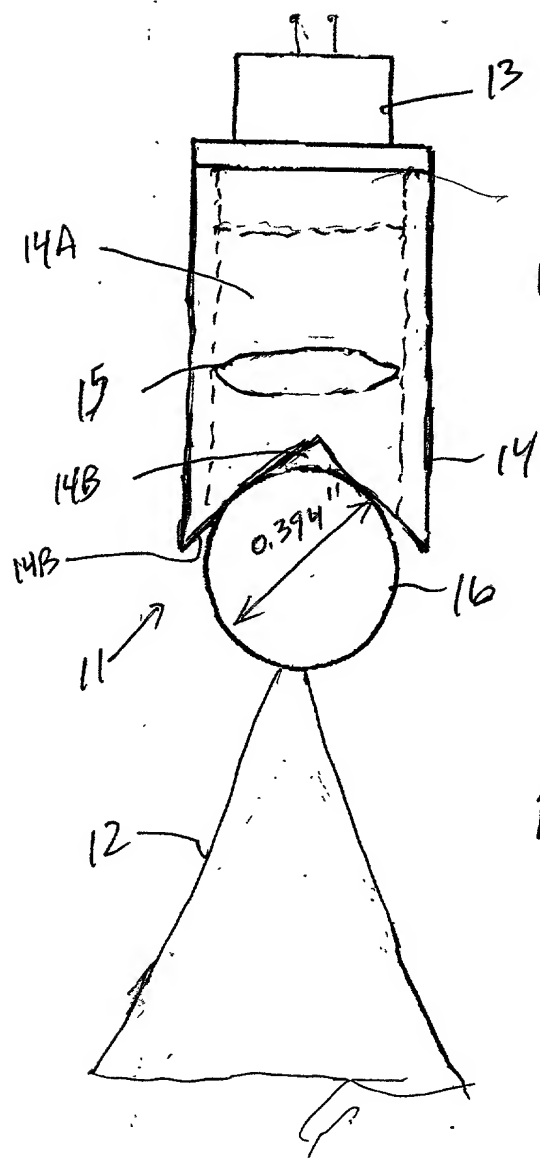


FIG. 1G15A

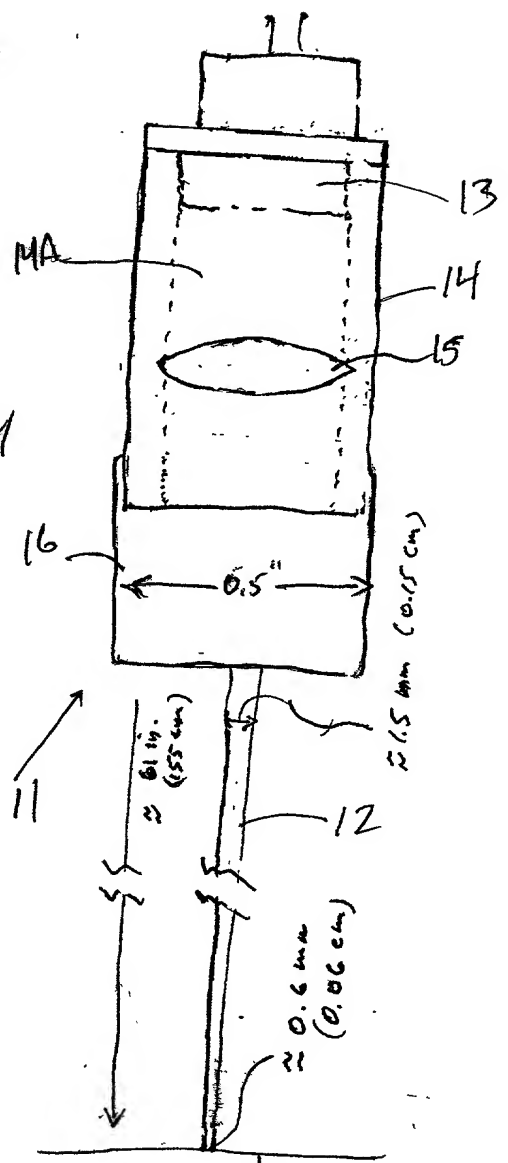


FIG. 1G15B

furthest
object/working
distance

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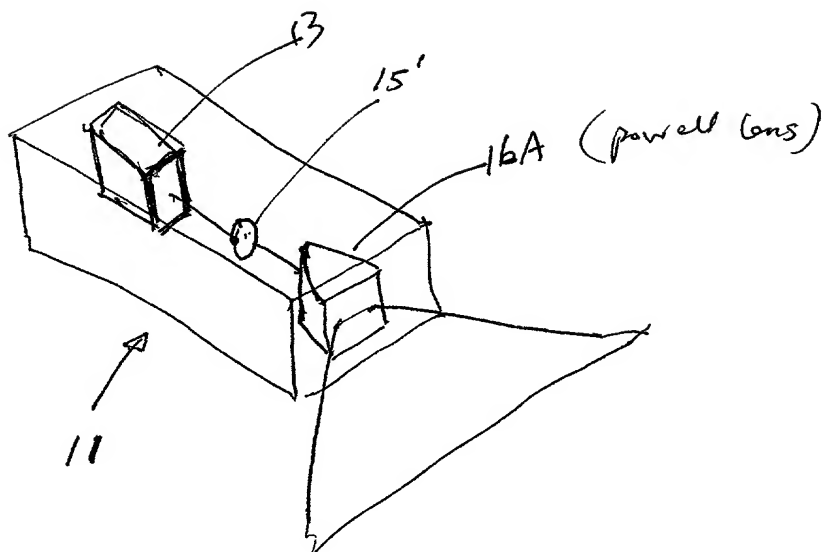


FIG. 1G.16A

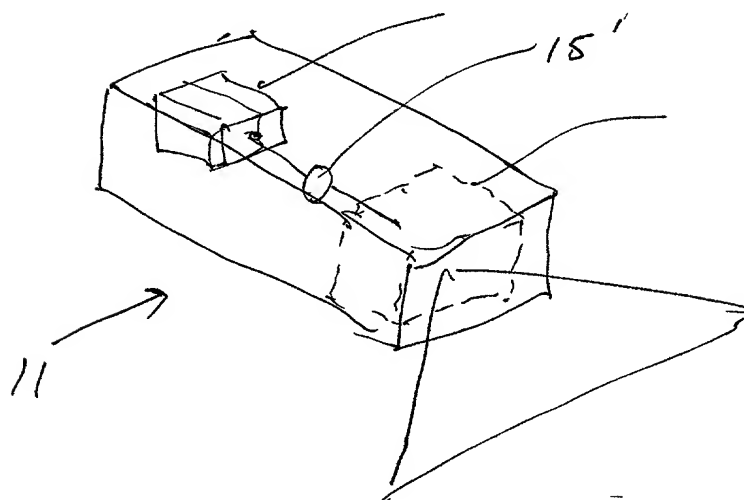


FIG. 1G.16B

PLIM w/
powell lens

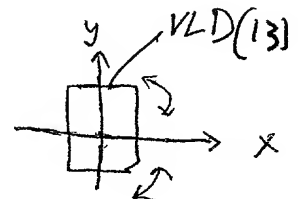
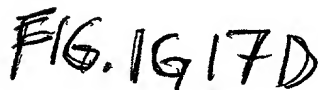


FIG. 16, 17F

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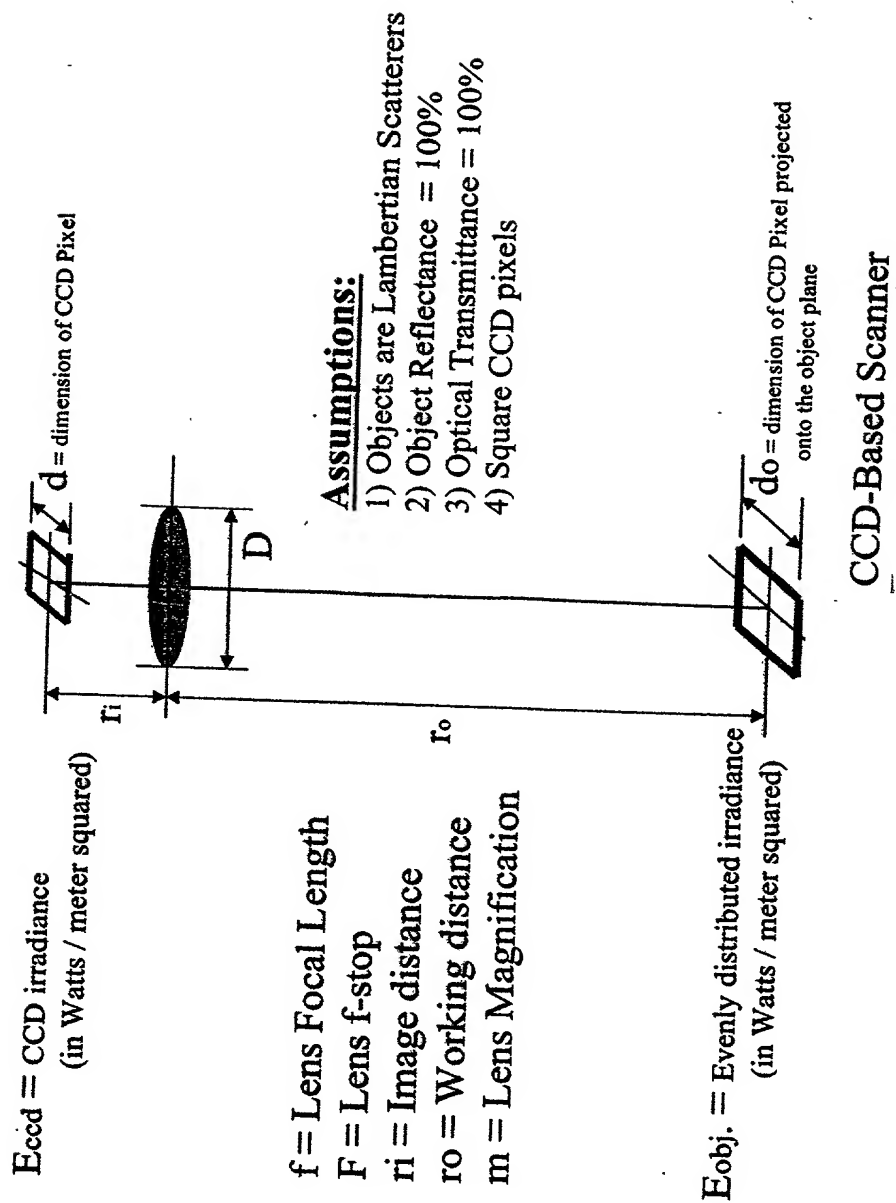


FIG. 1H6

FIRST GENERALIZED METHOD
of Reducing Speckle-Noise
PATTERNS AT IMAGE
Detection array of the
SPM subsystem (3)

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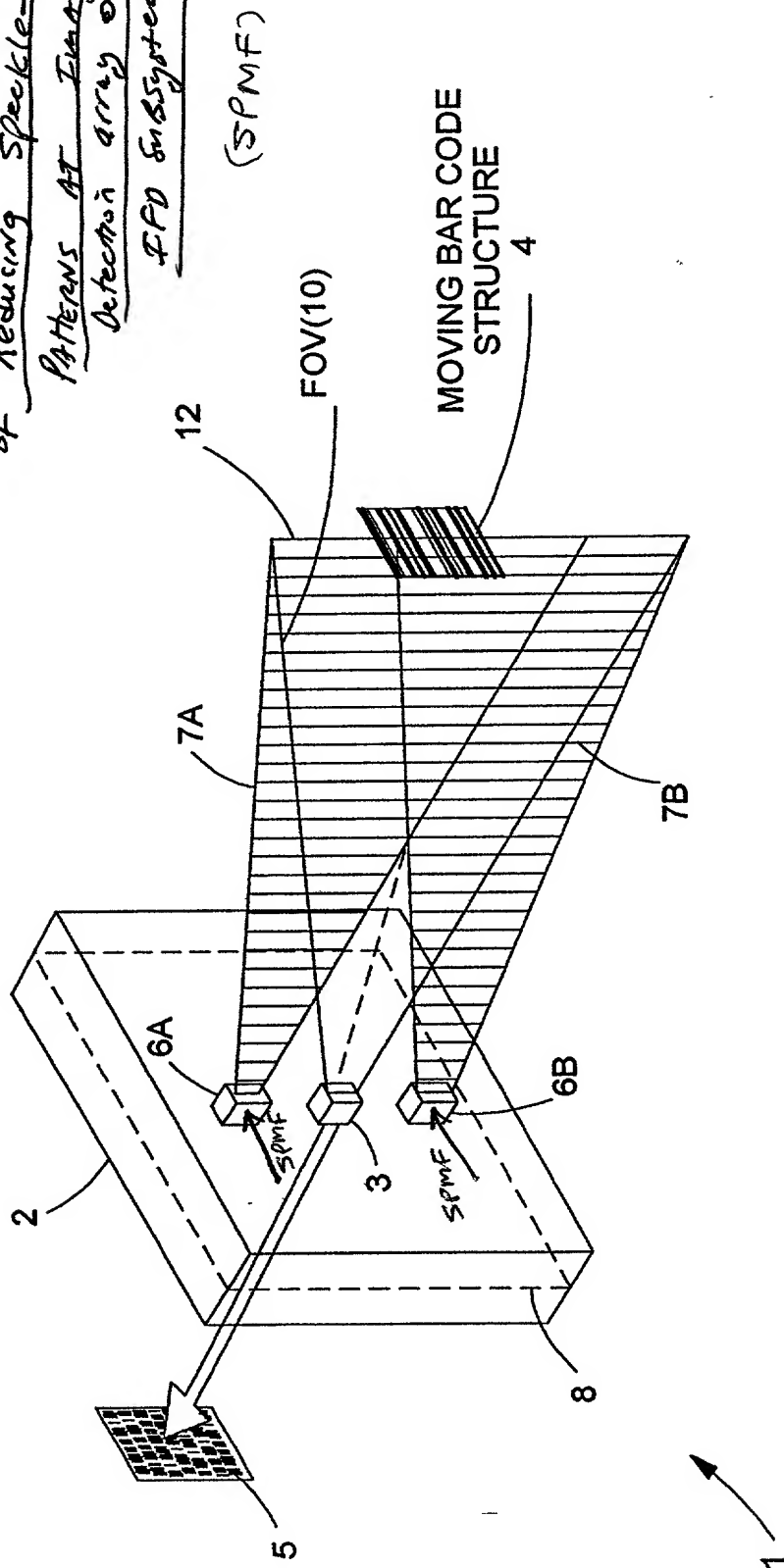


FIG. 1I1

The First Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial phase of the transmitted PLIB along the planar extent thereof according to a spatial phase modulation function (SPMF) so as to produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the power of the speckle-noise pattern observed at the image detection array.

FIG. 1I2B

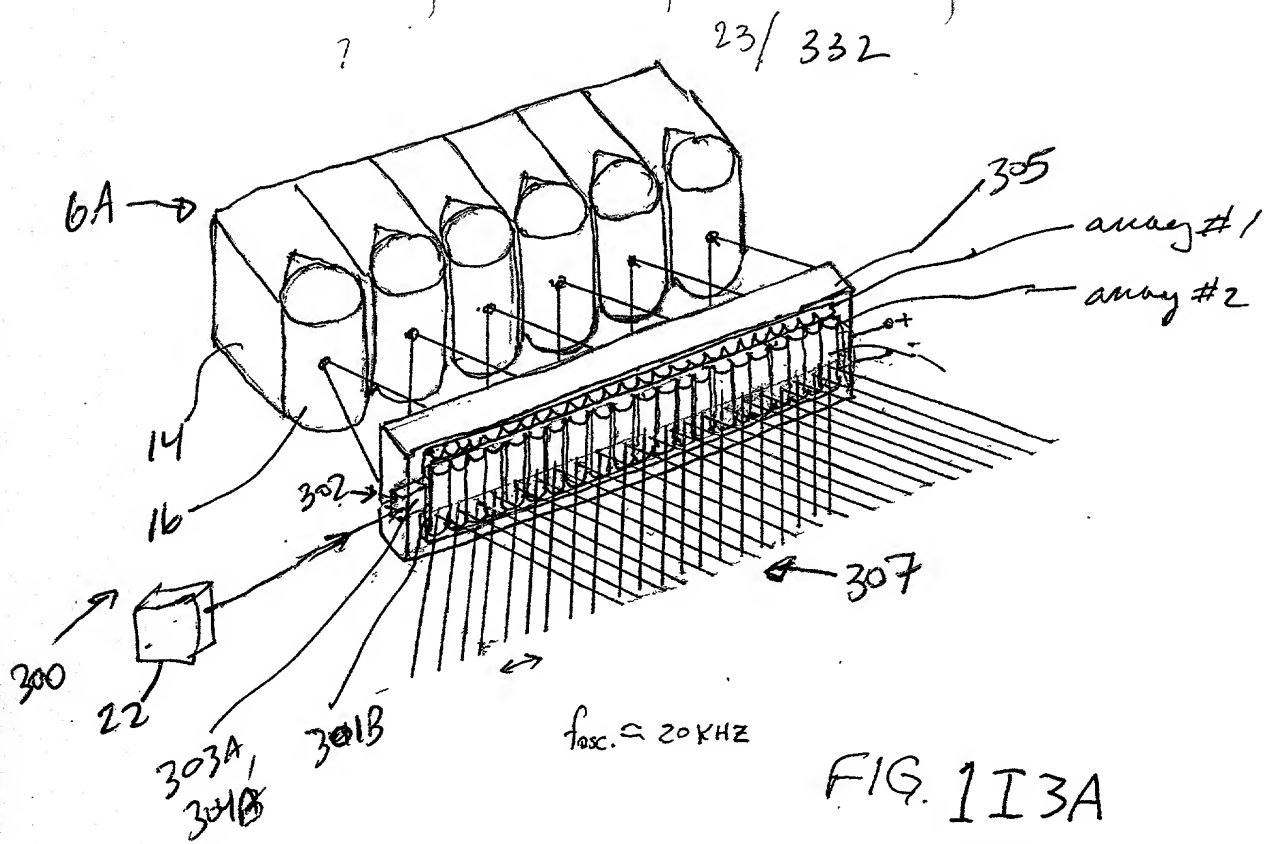


FIG. 113A

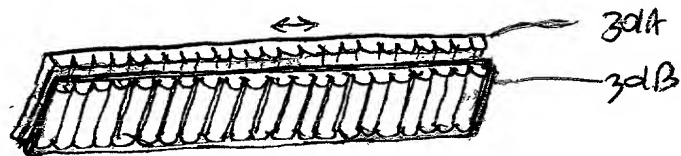


FIG. 113B

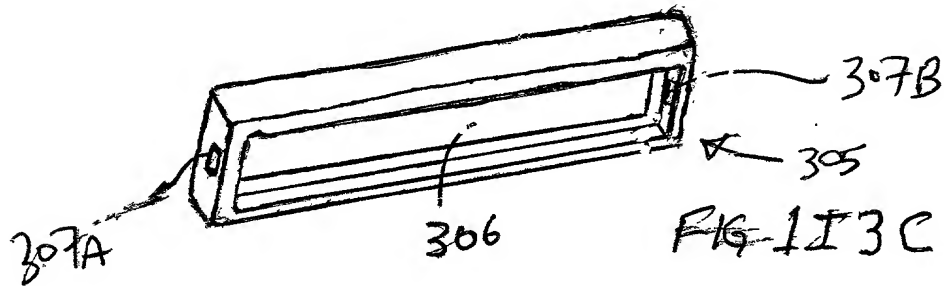


FIG-1I3C

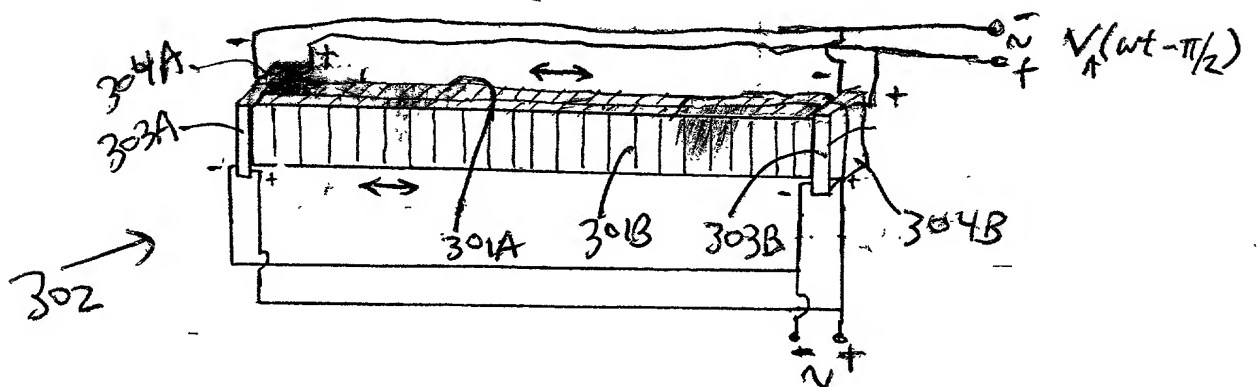


FIG. 113D V(wt)

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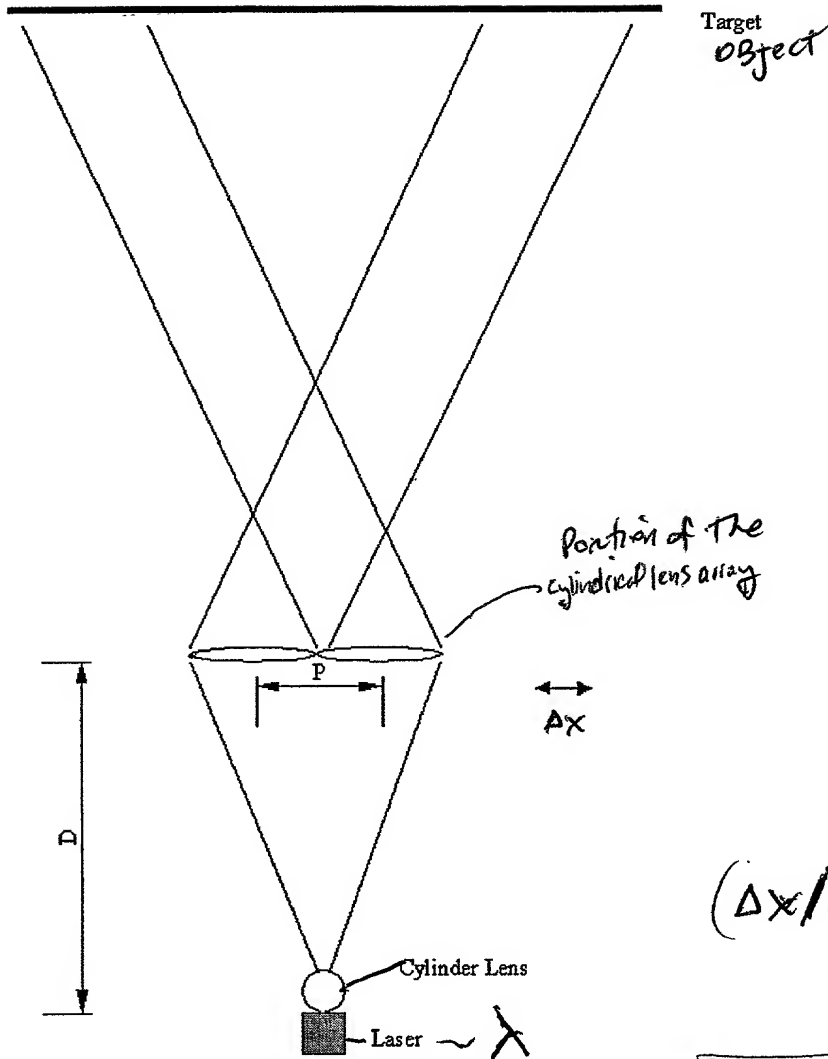


Figure 1

$$(\Delta x / D) P = \lambda$$

$$\Delta x \geq \frac{\lambda \cdot D}{P}$$

FIG. 1 I 3 E

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FIG. 1I3F

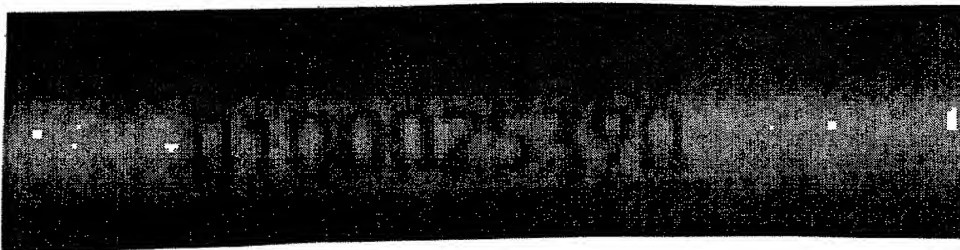
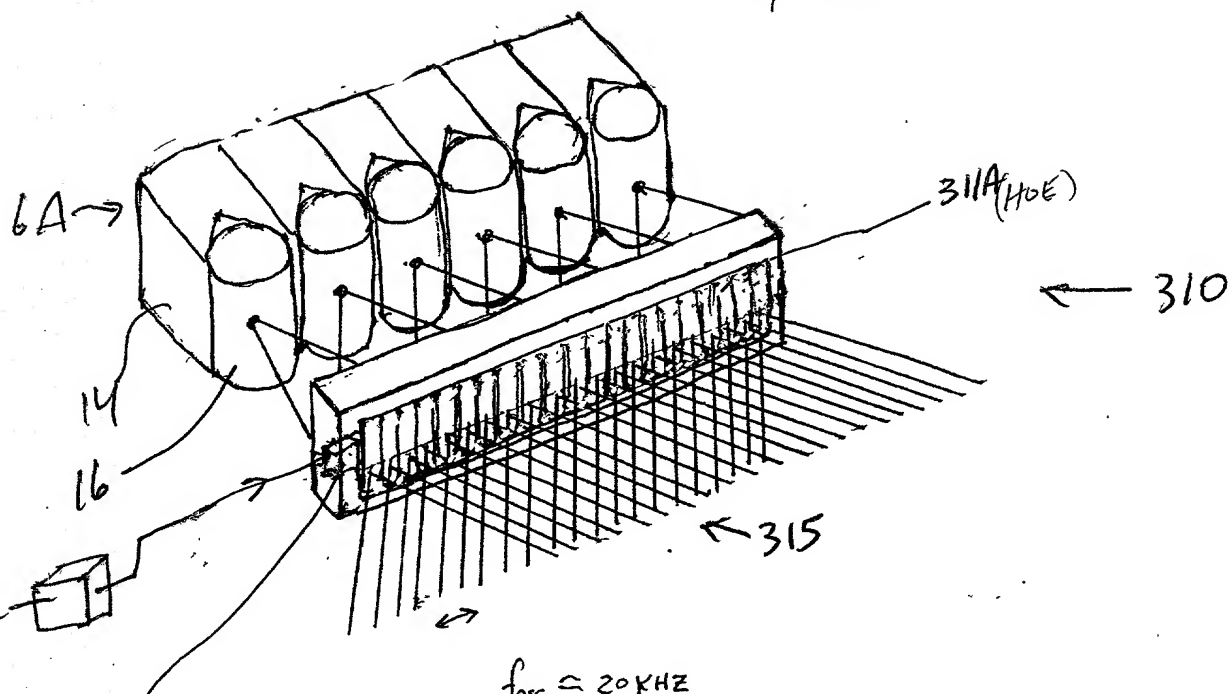
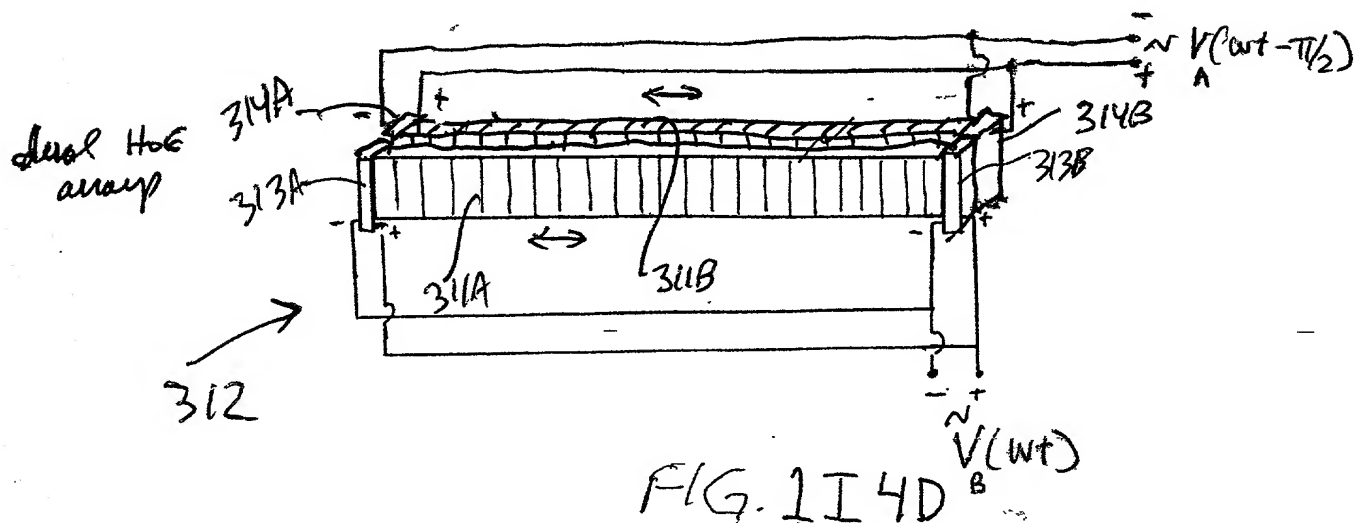
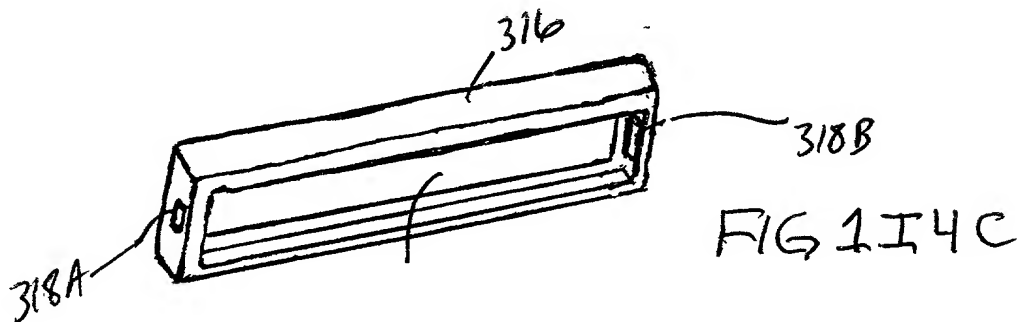
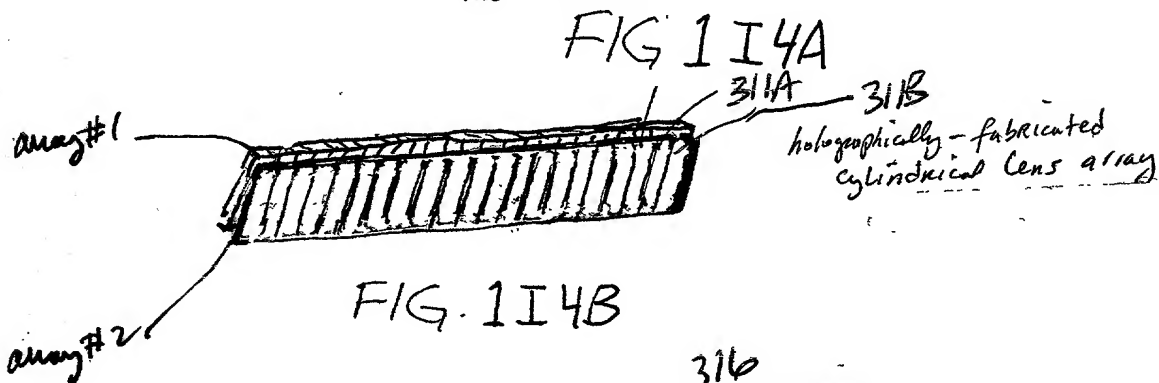


FIG 1I3G

40063603-020602



$f_{osc} \approx 20 \text{ KHZ}$



10068803-020602

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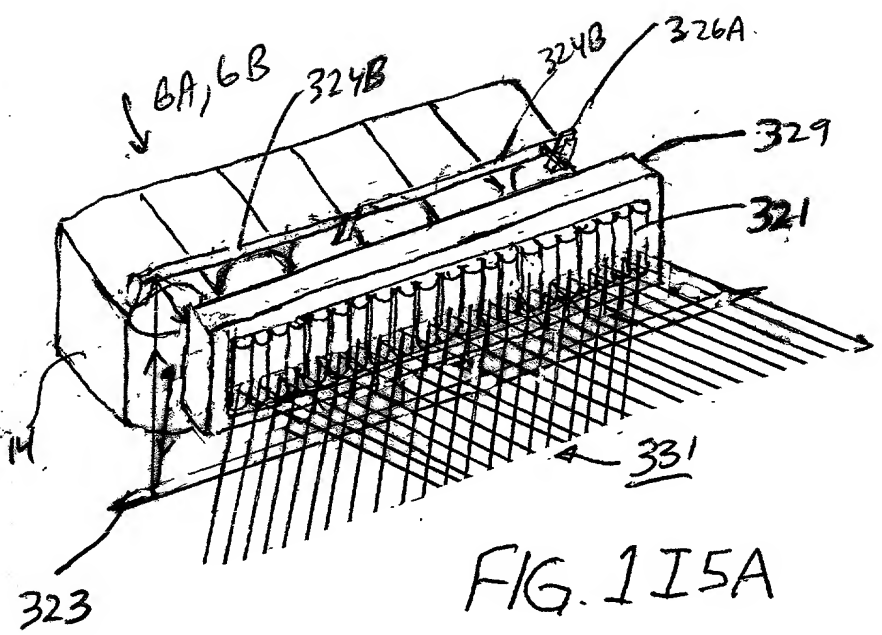


FIG. 1I5A

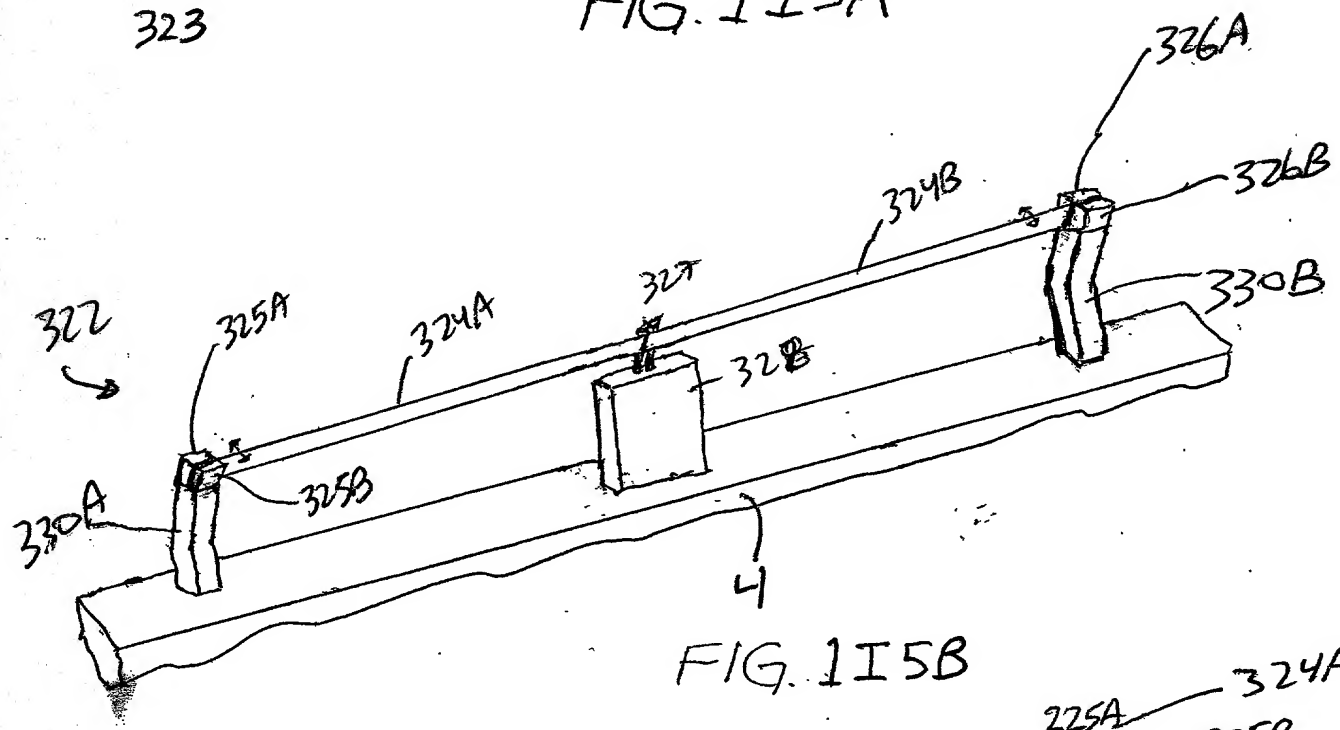


FIG. 1I5B

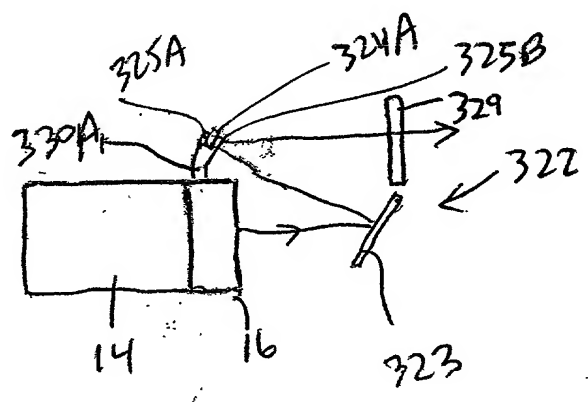


FIG. 1I5C

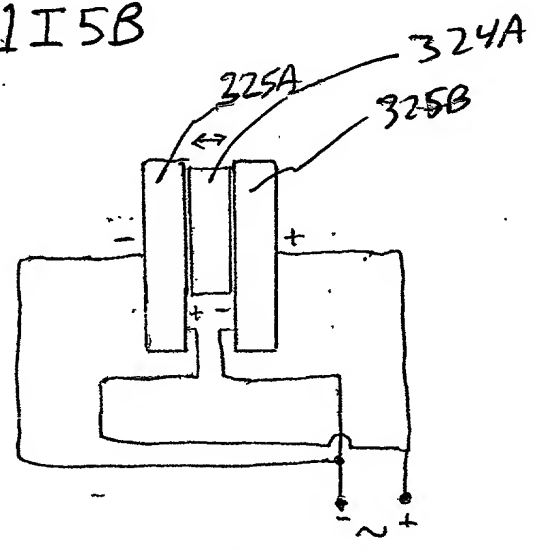
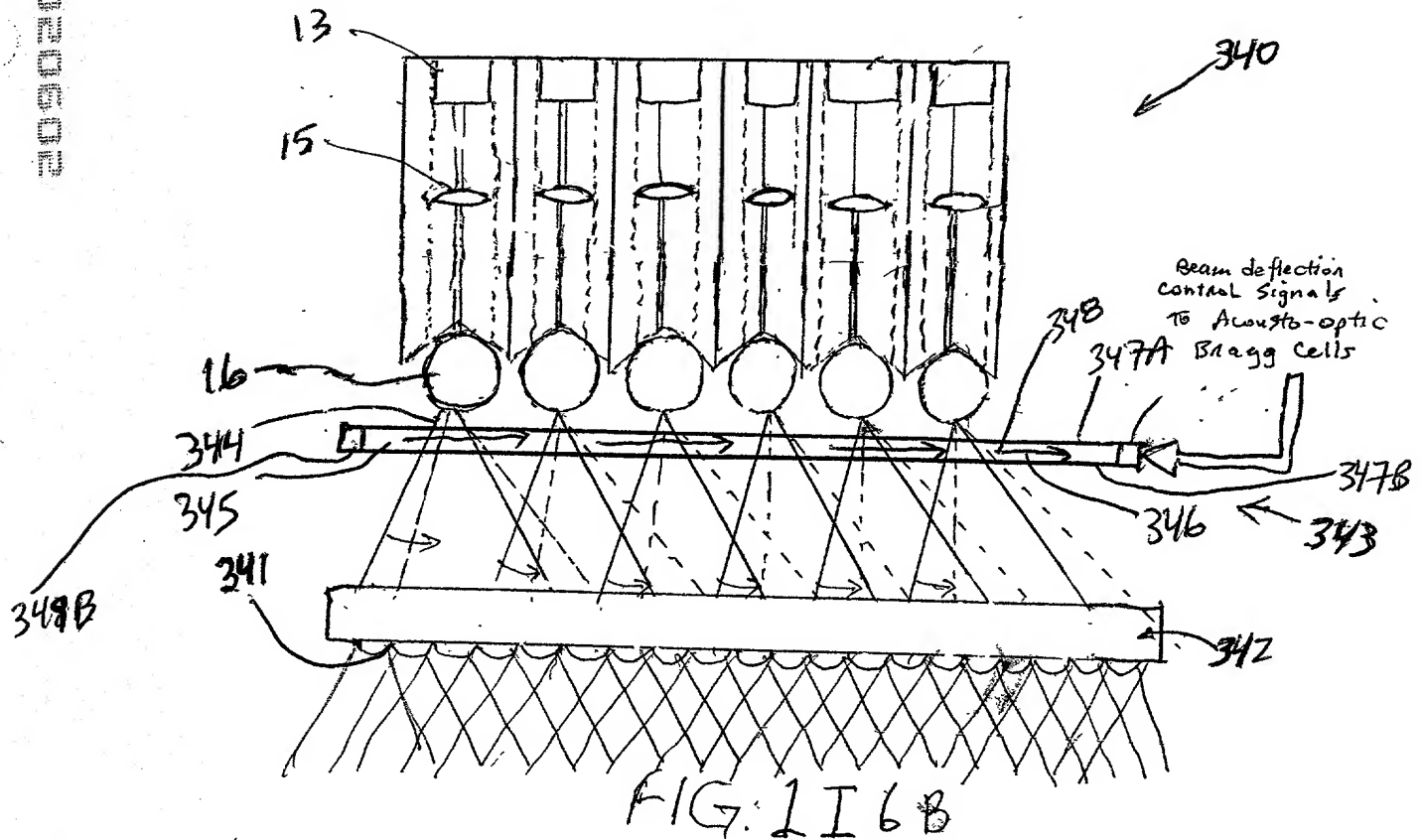
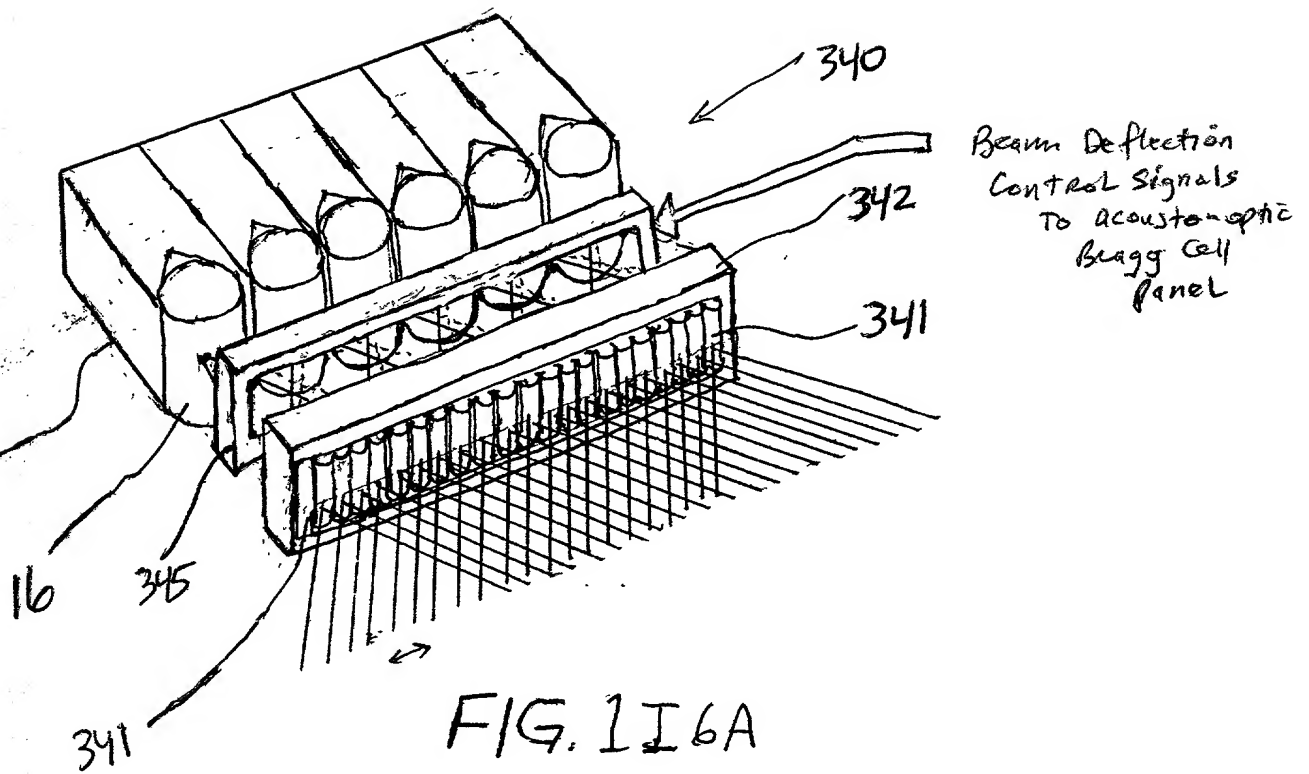
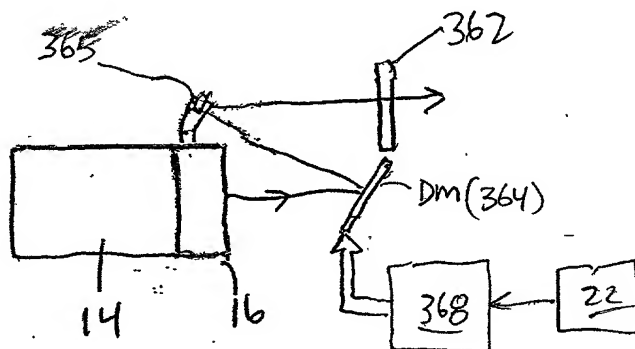
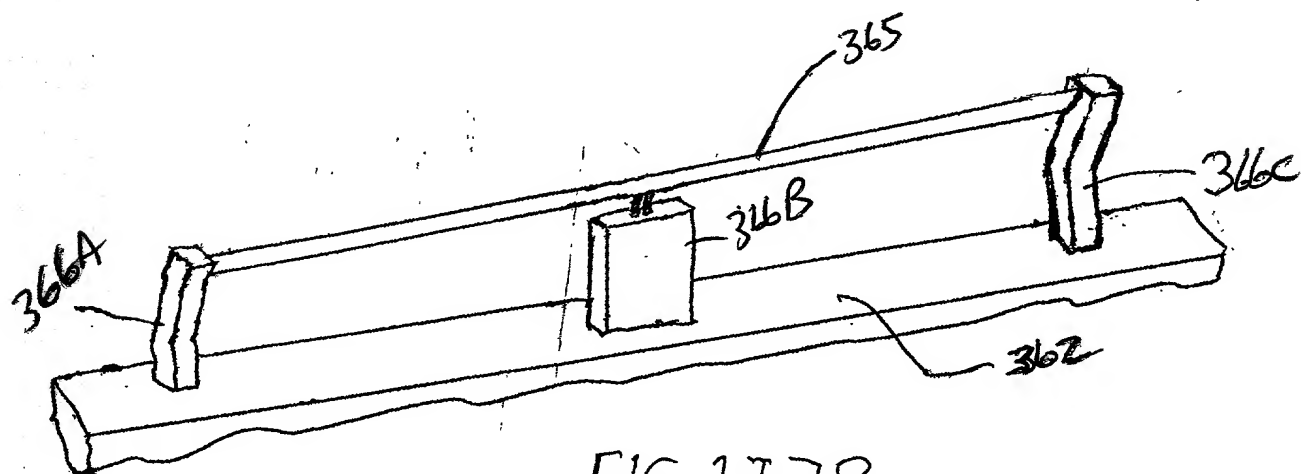
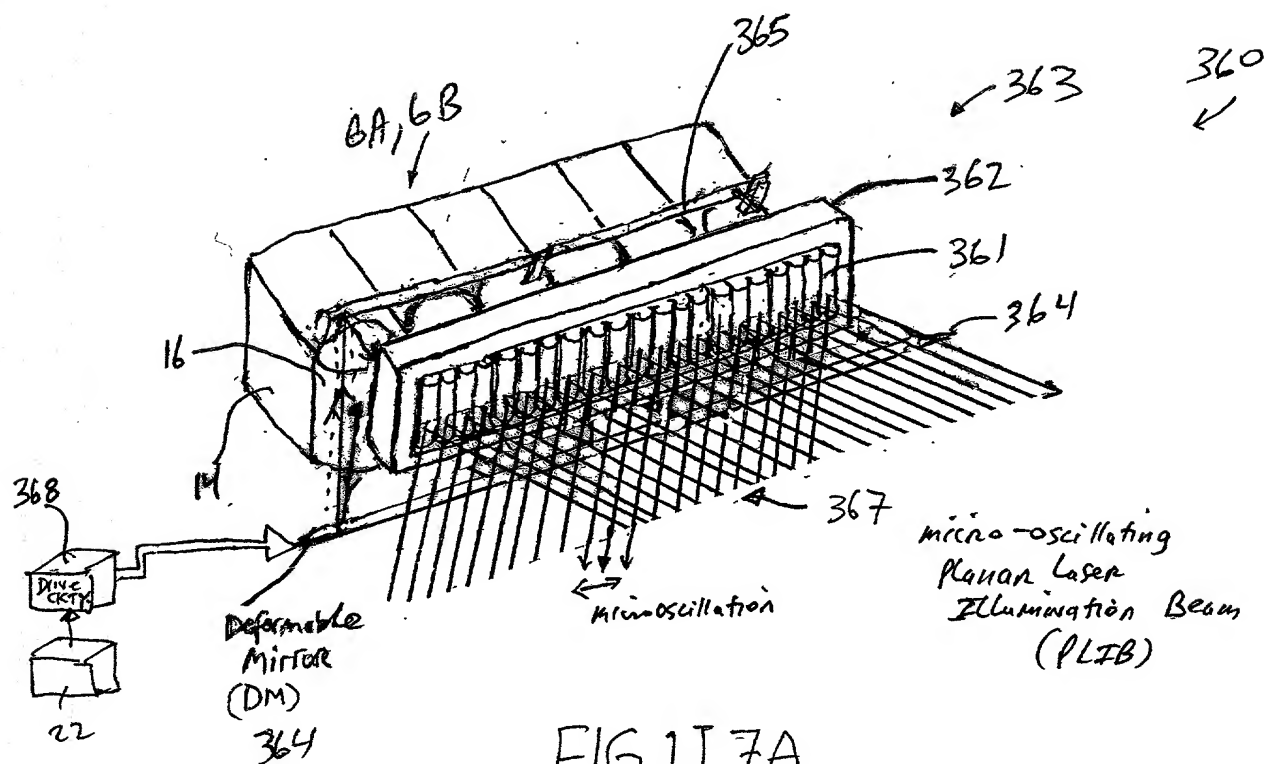
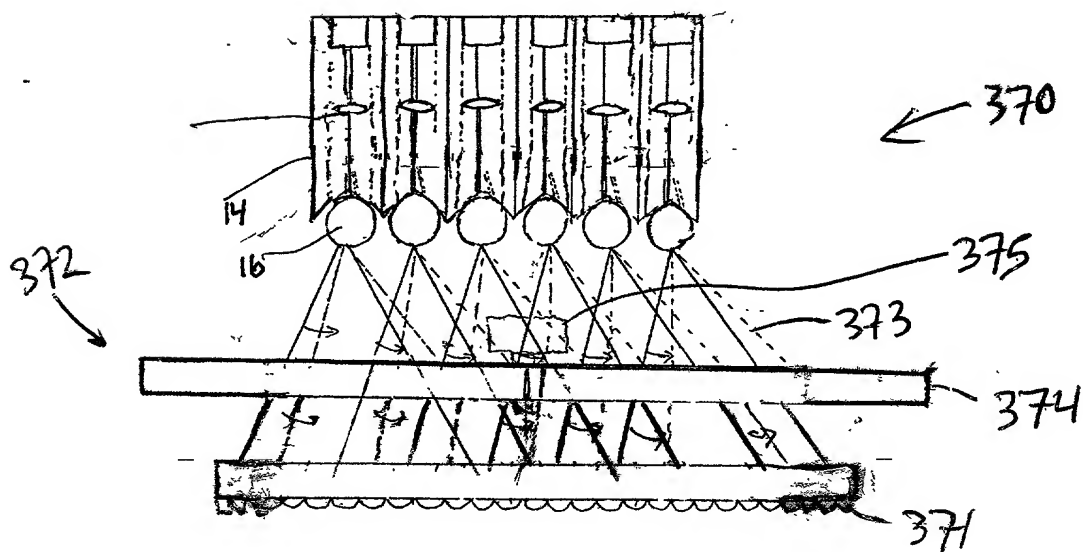
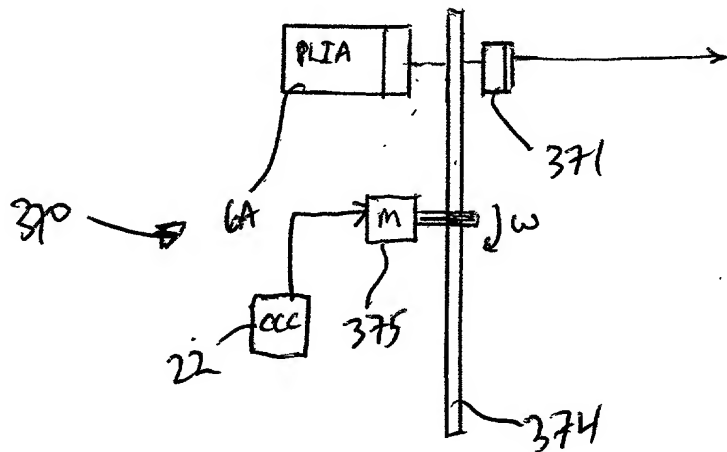
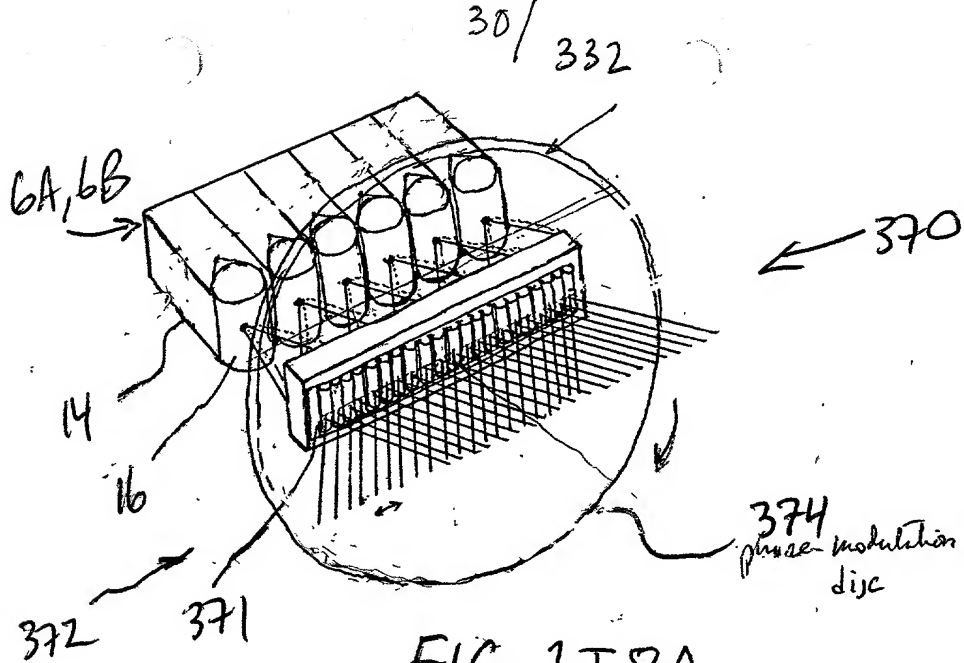
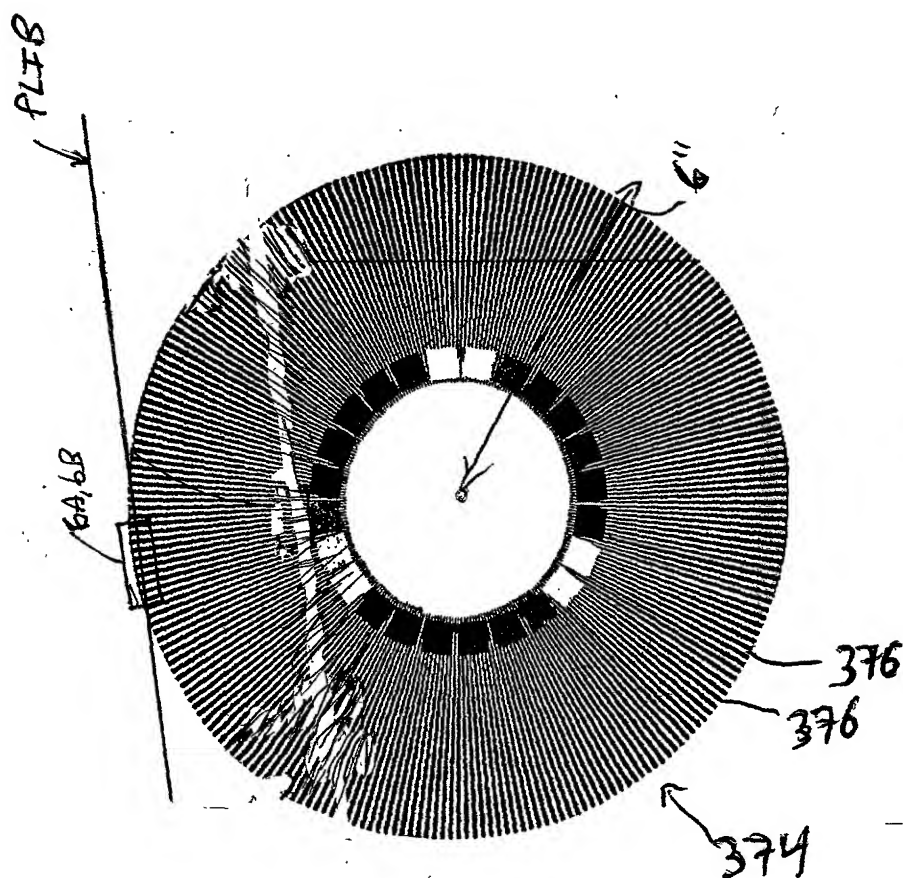
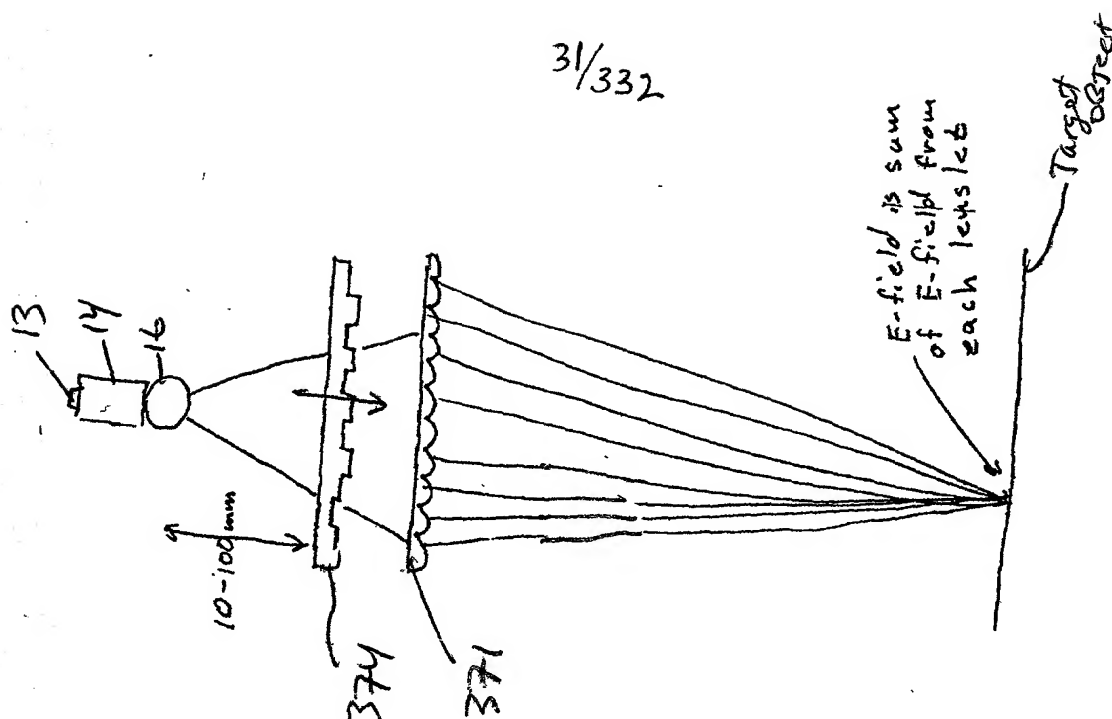


FIG. 1I5D







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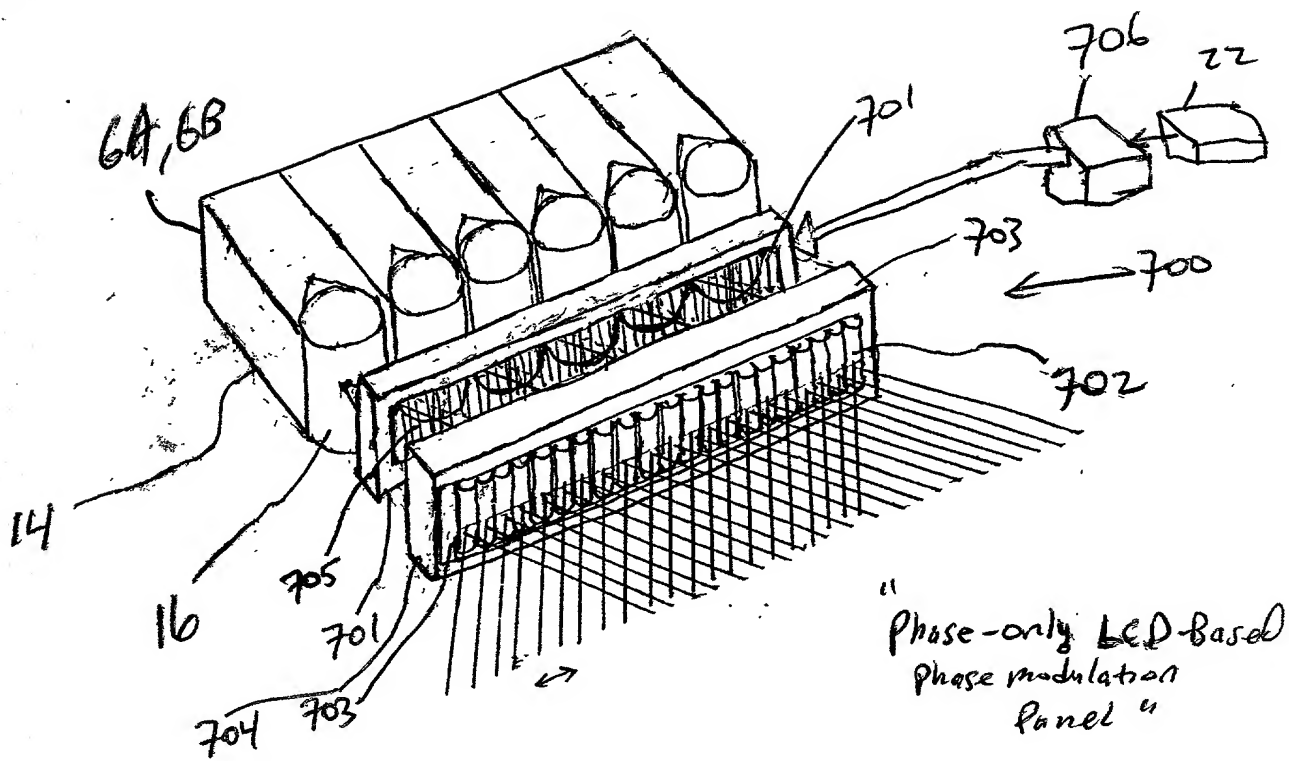


FIG. 1I8F

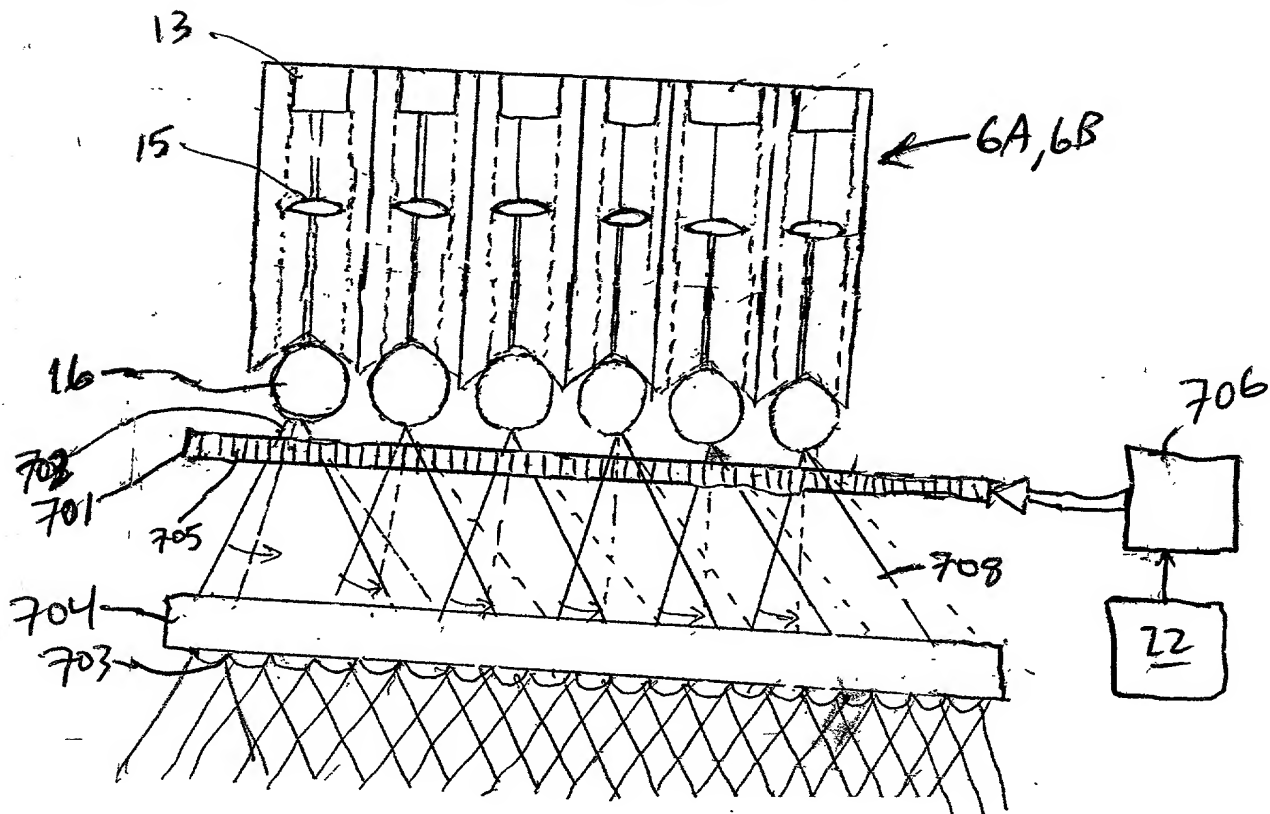


FIG. 1I8G

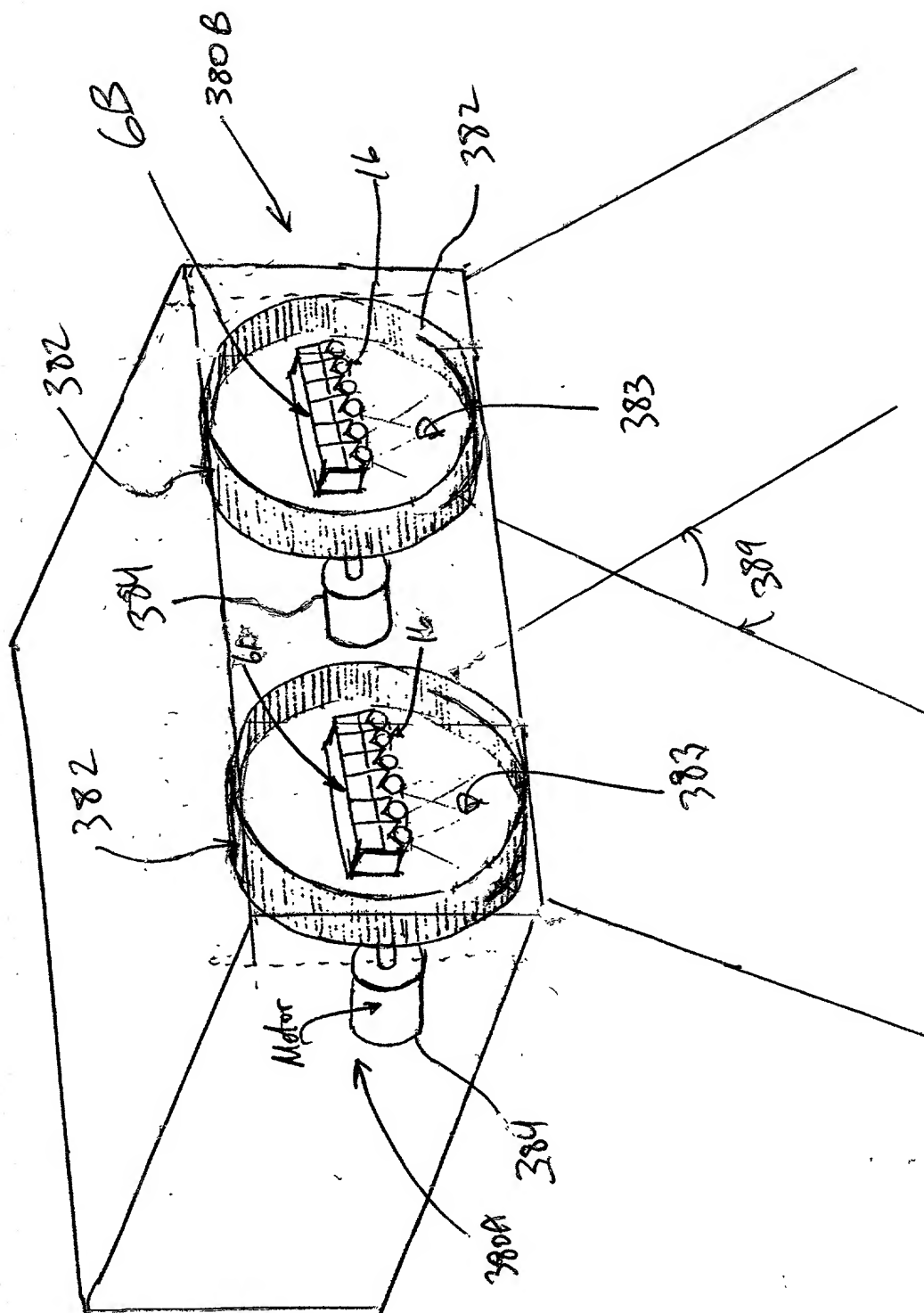


FIG. 1I 9A

Optical Specifications:

- 30 cylindrical lens (lenses) per linear inch
- focal length ≈ 2.0 millimeters
- diameter of cylindrical carousel ≈ 4 inches
- acrylic material

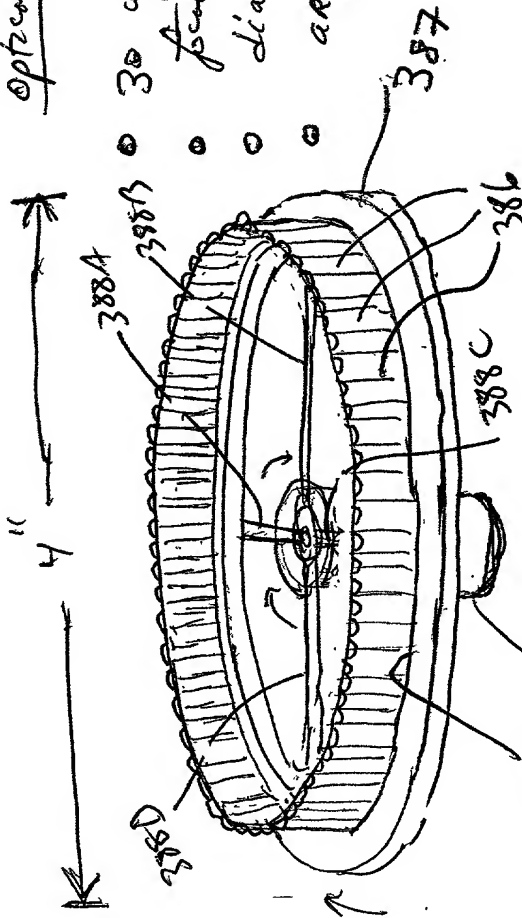


FIG. 1I9B

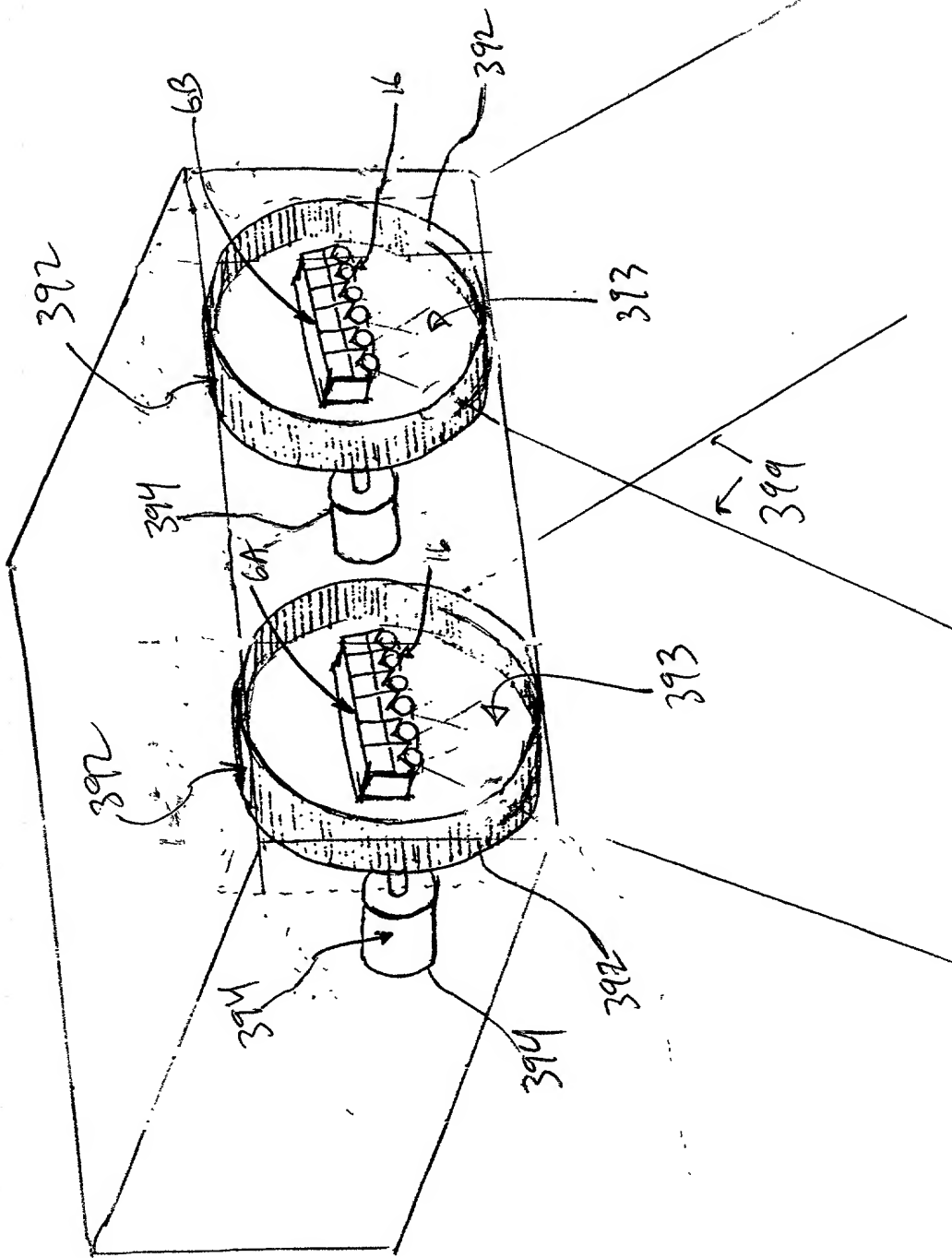


FIG. 1110A

Optical Specifications:

- 30 cylindrical lens (lens) per linear inch
- total length : 2.0 millimeters
- diameter of lens carousel ≈ 4 inches

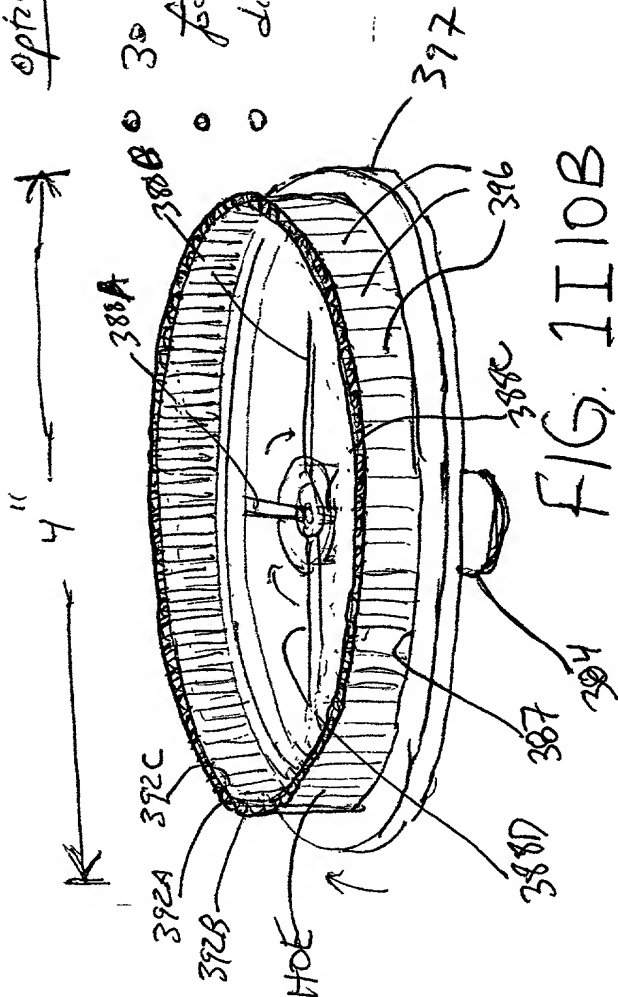


FIG. 1110B

20090220-10068800T

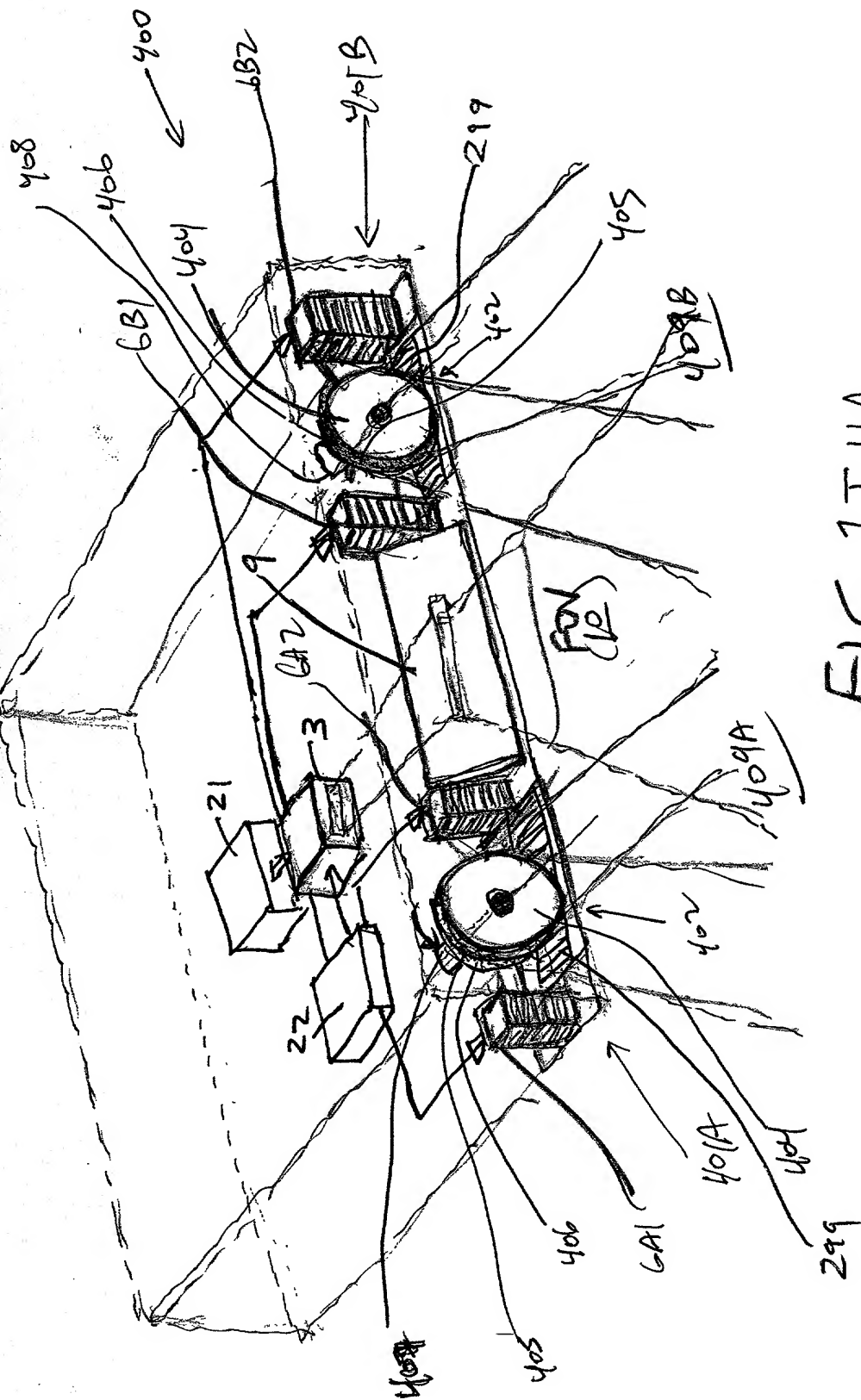
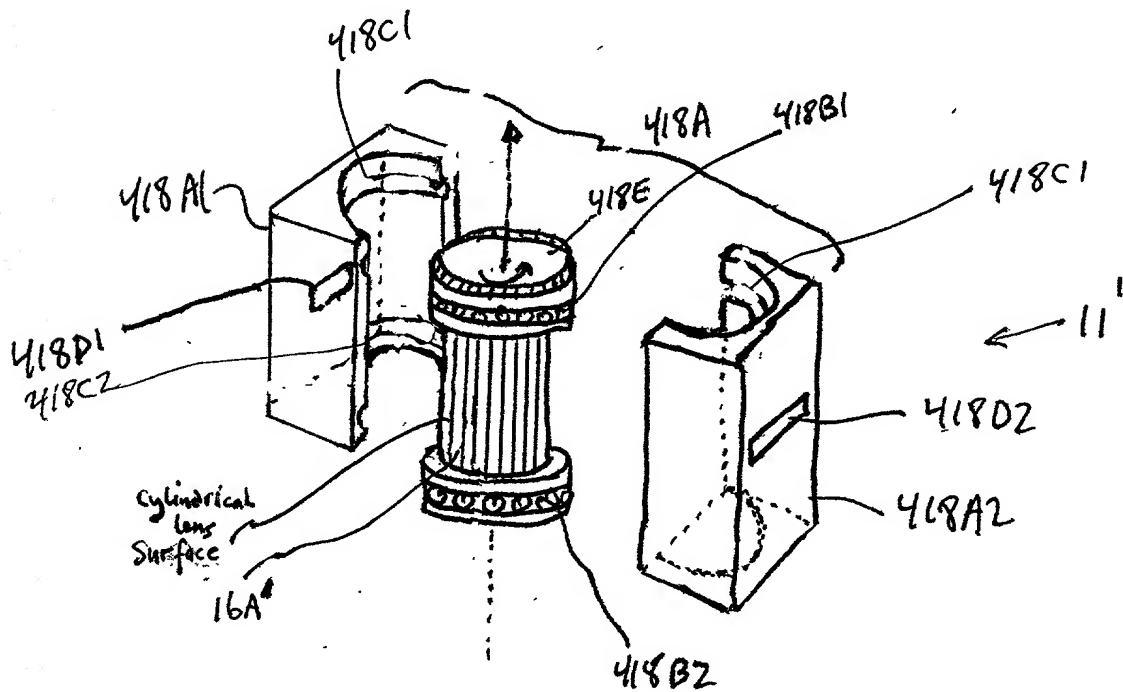
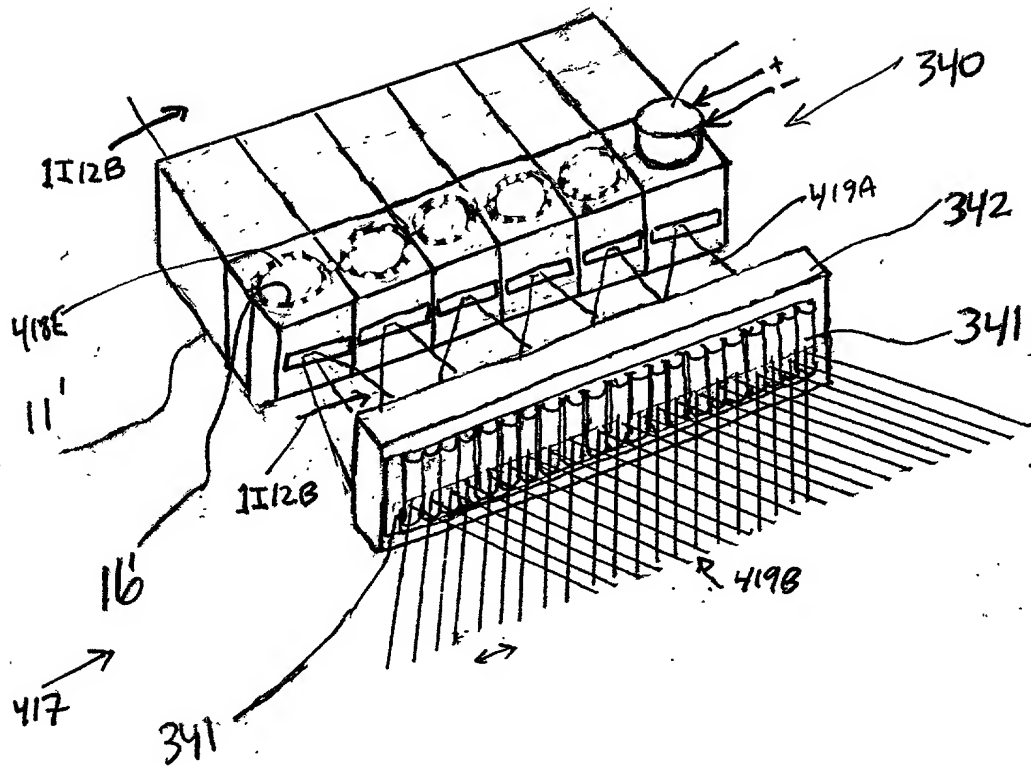


FIG. 111A

[illegible]



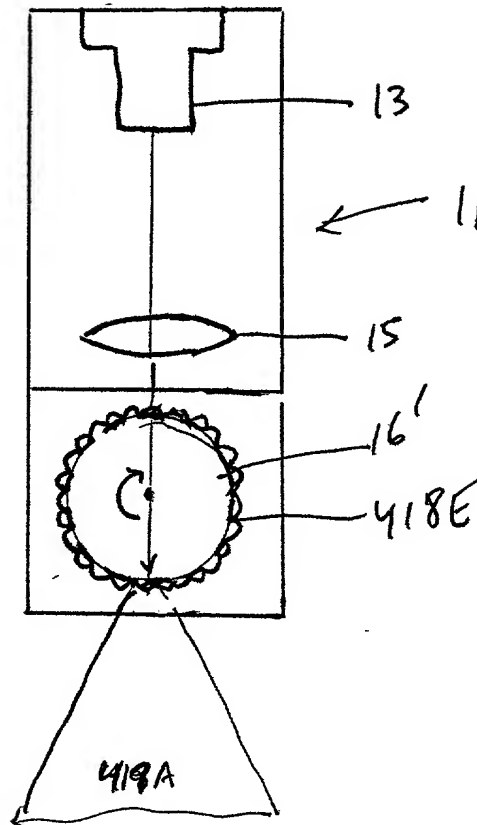


FIG. 1I12C

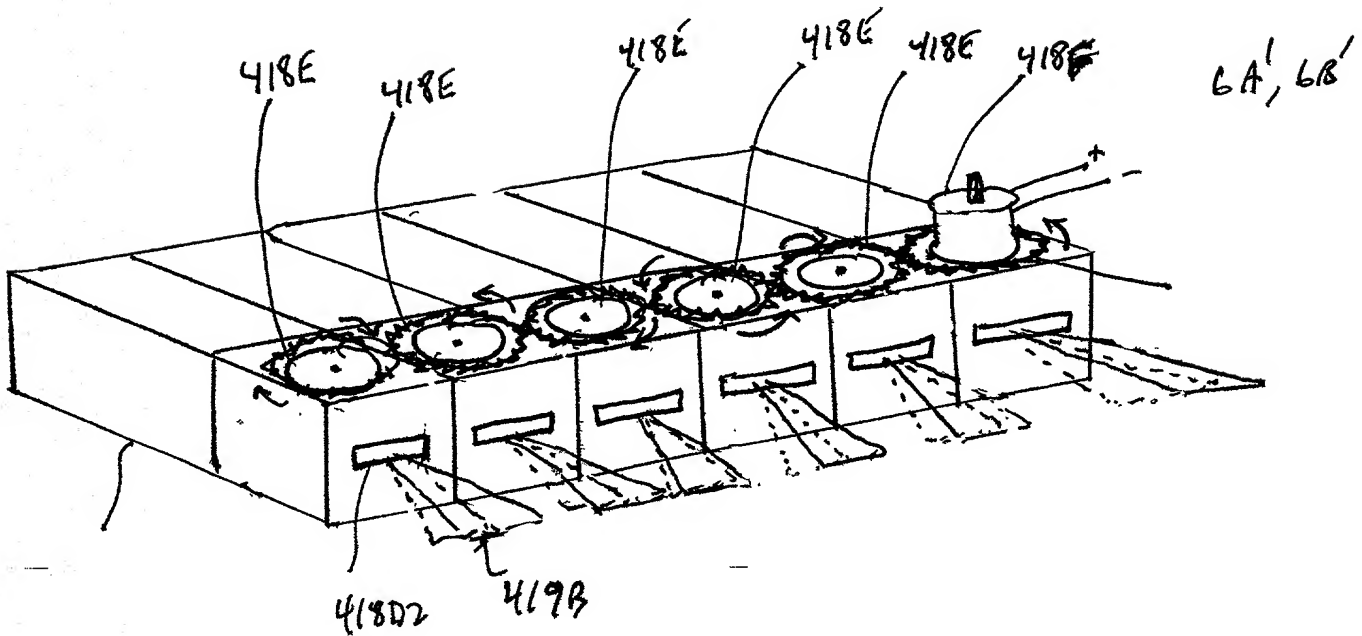


FIG. 1I12D

Second Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TIME)

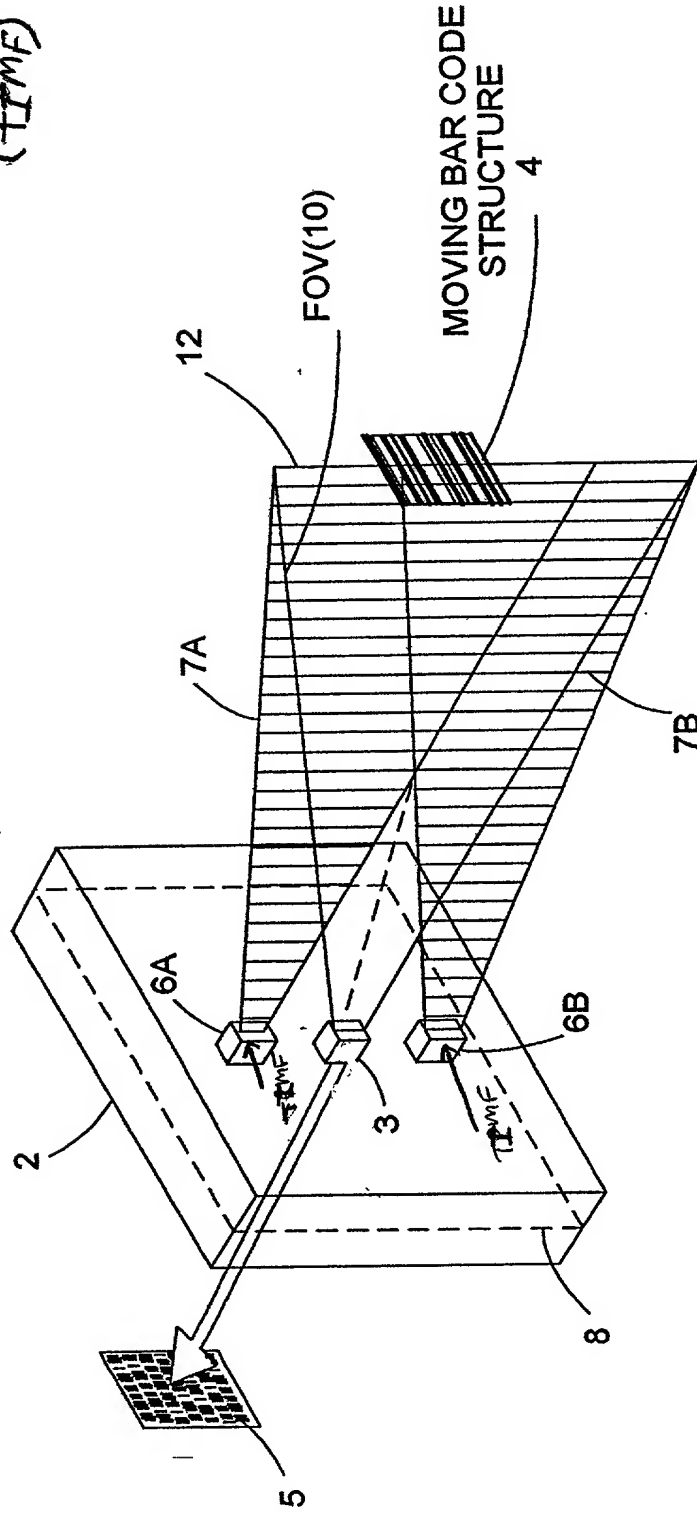


FIG. 11B

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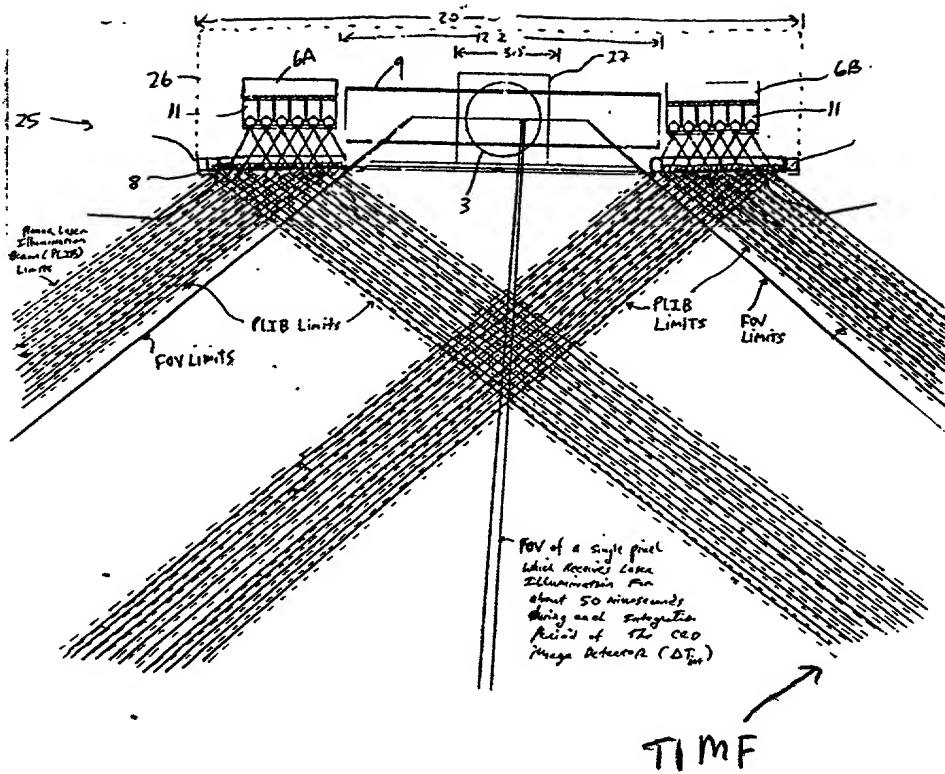


FIG. 1 I 13A

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The Second Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

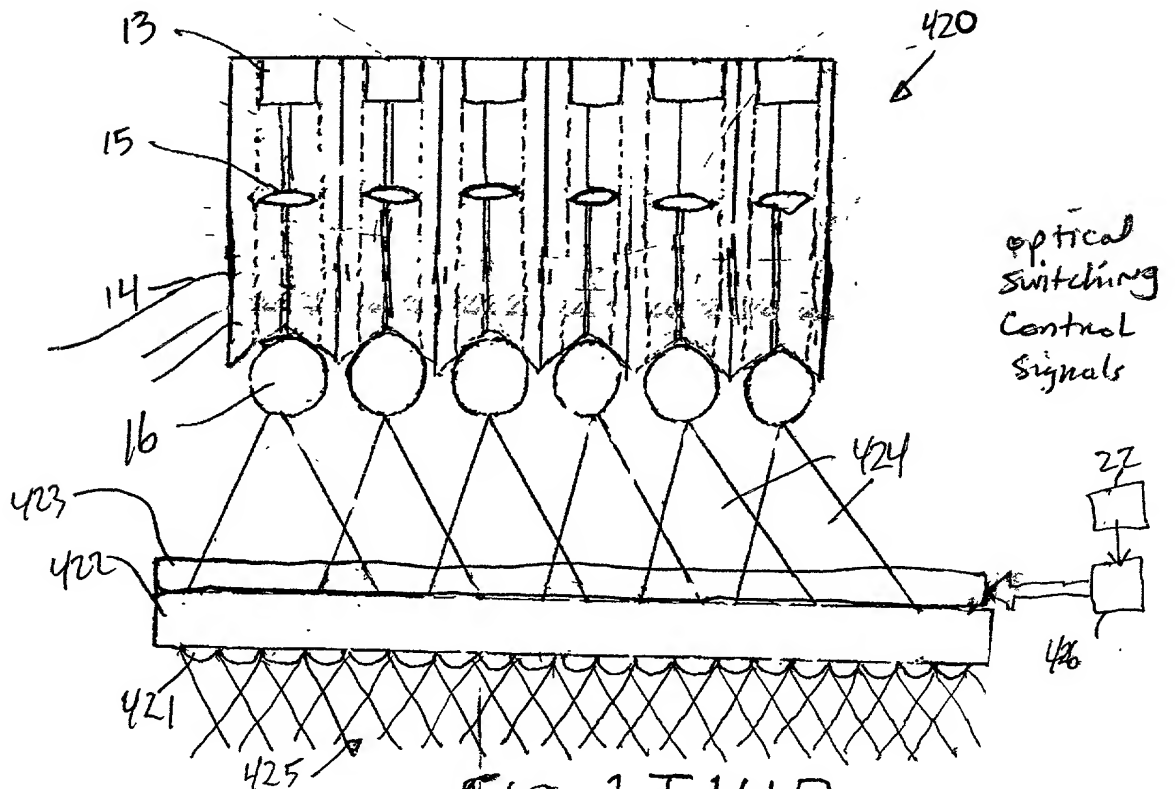
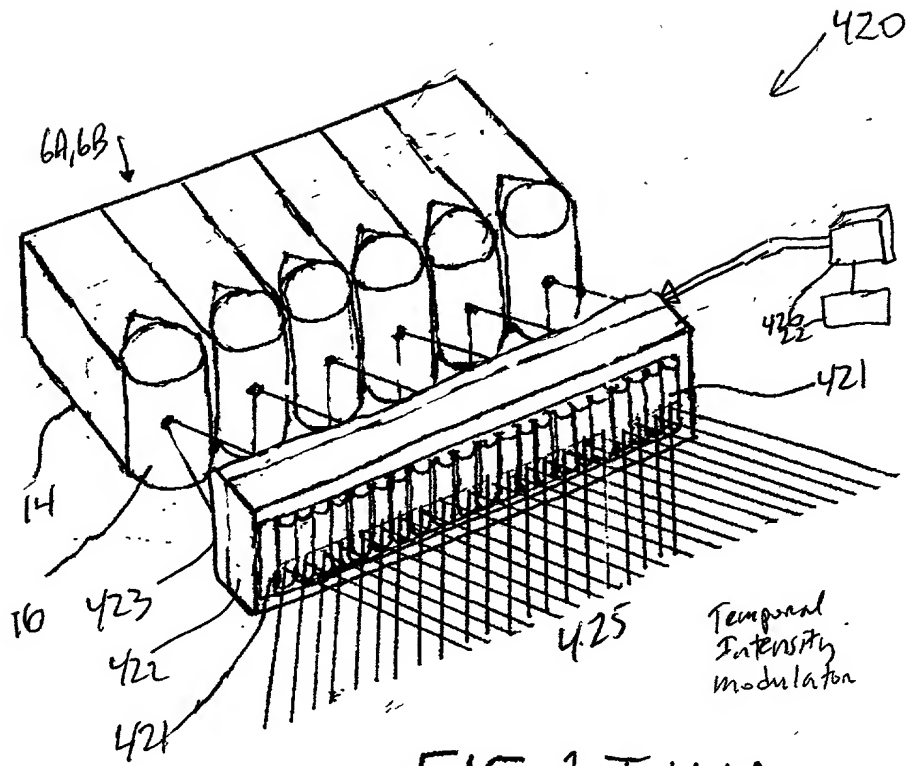
Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the transmitted PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to

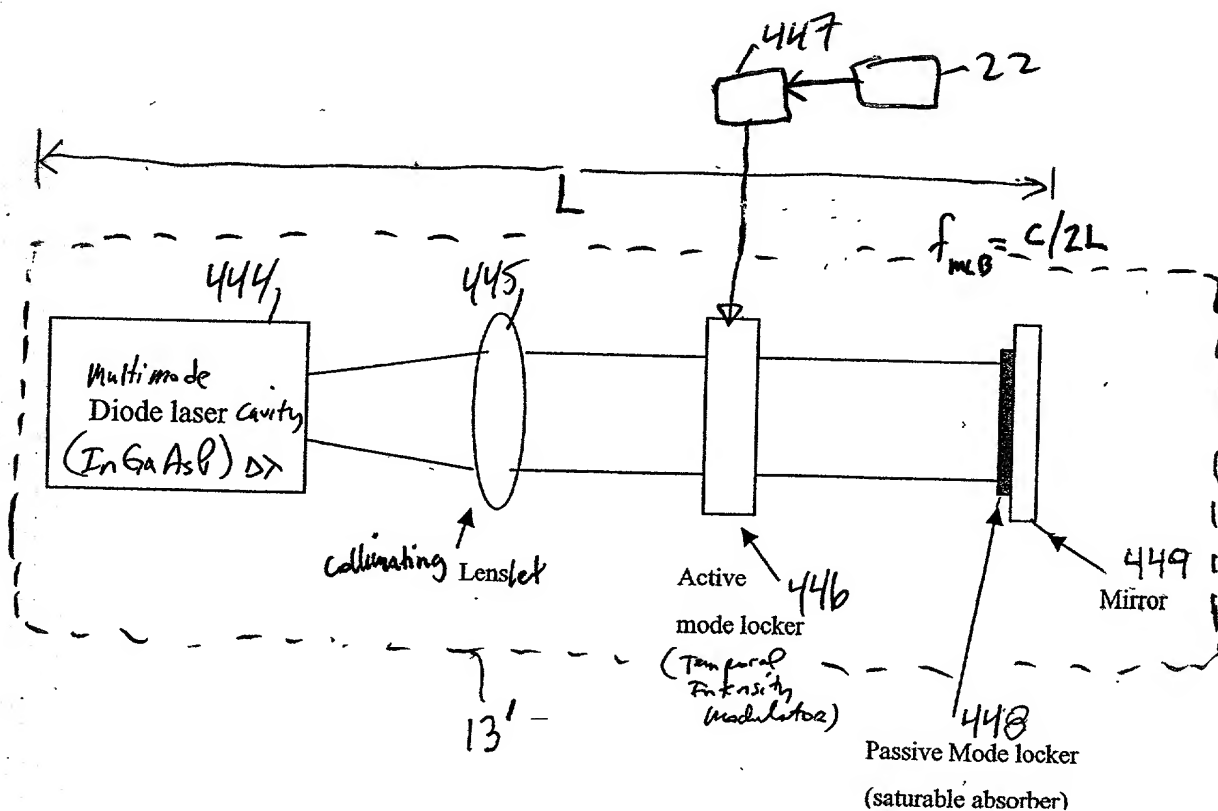
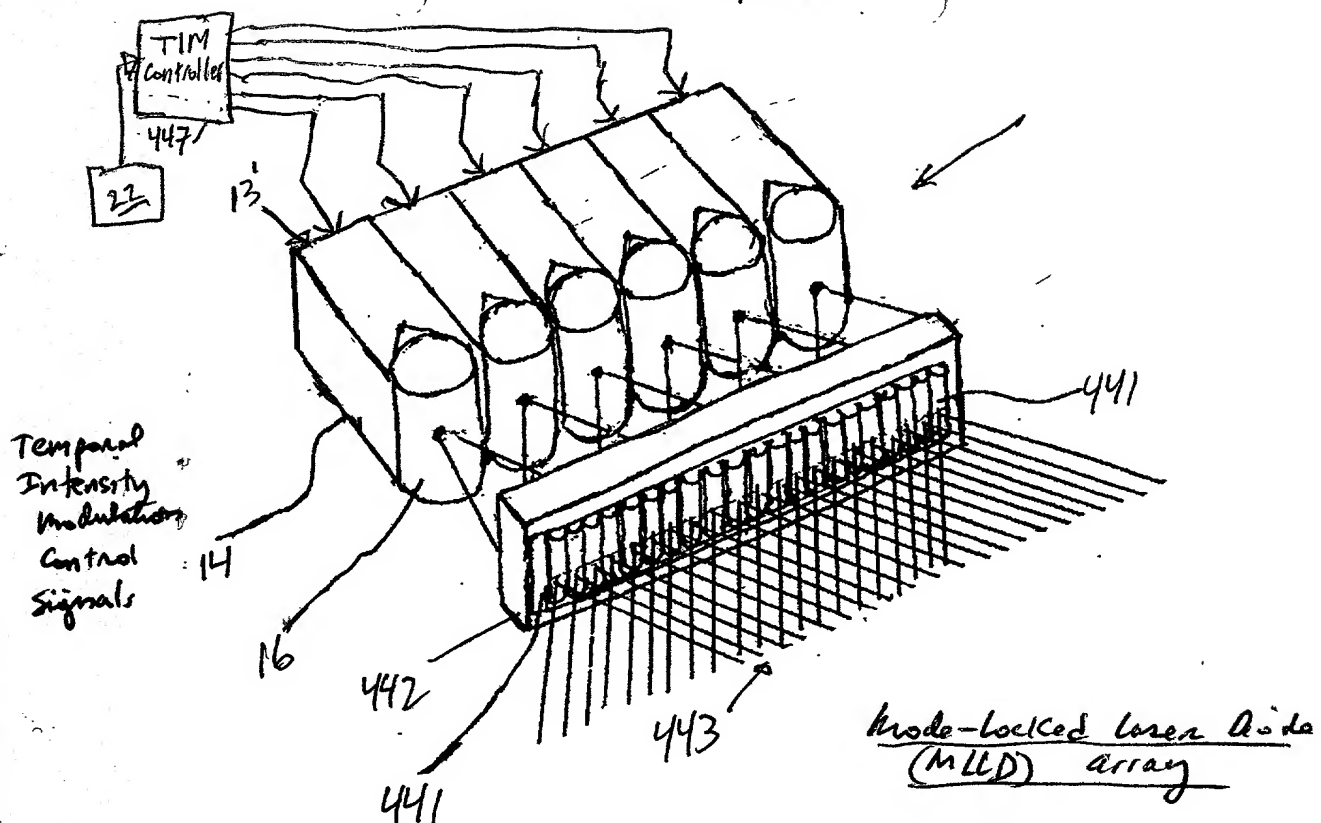
produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

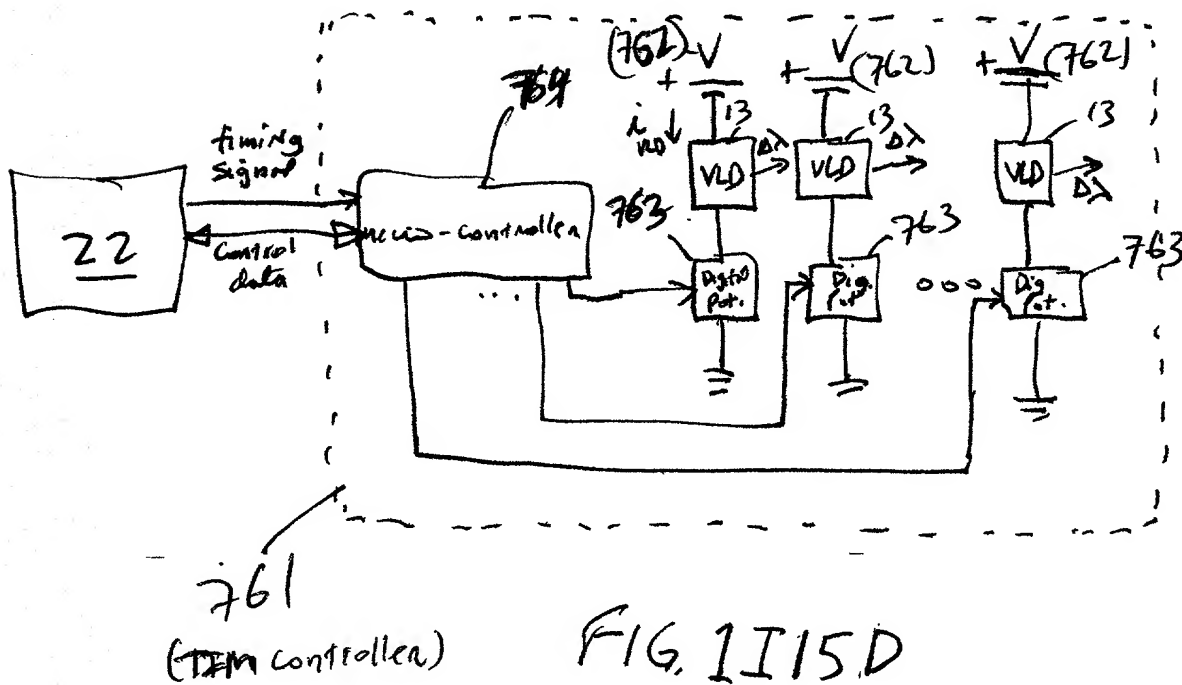
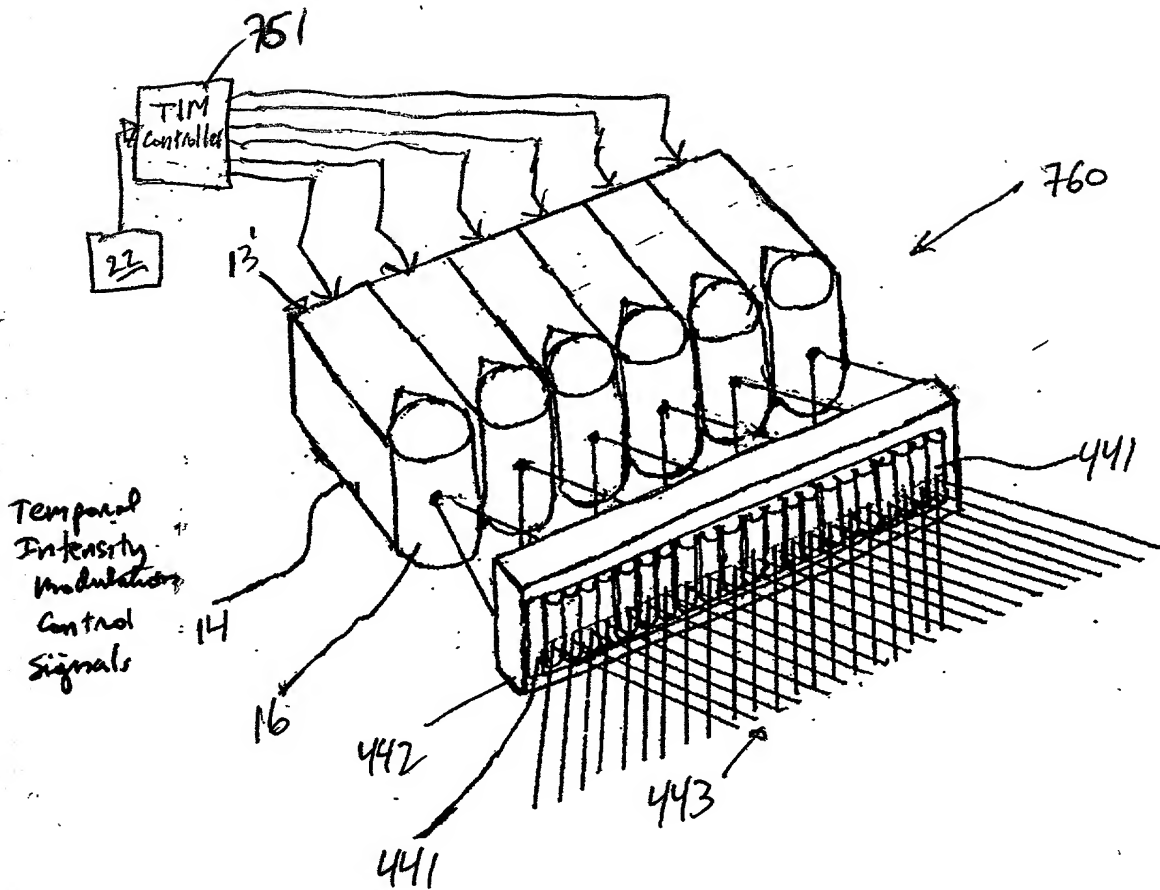
Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/3B

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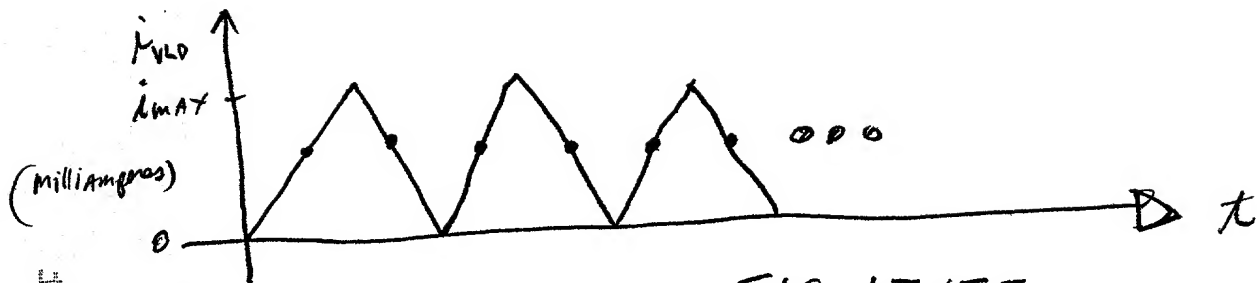


FIG. 1I15E

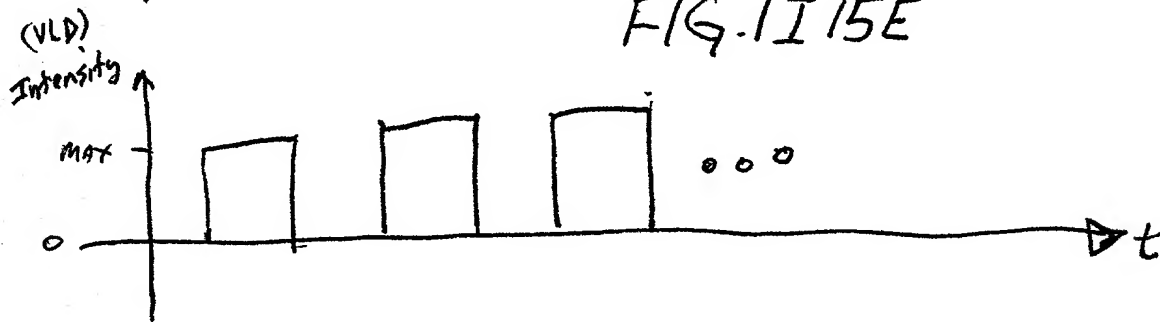


FIG. 1I15F

10066803.020602

Third Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TIME)

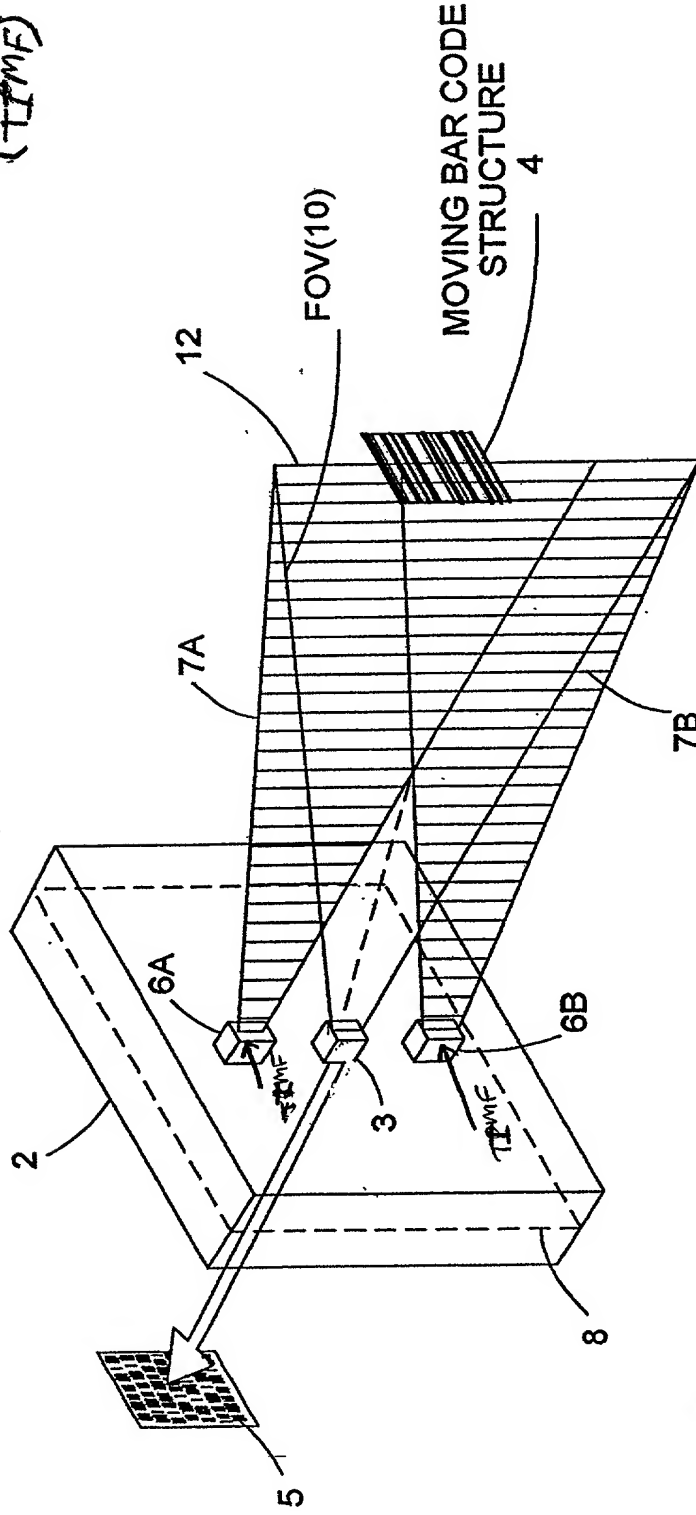


FIG. 11 16

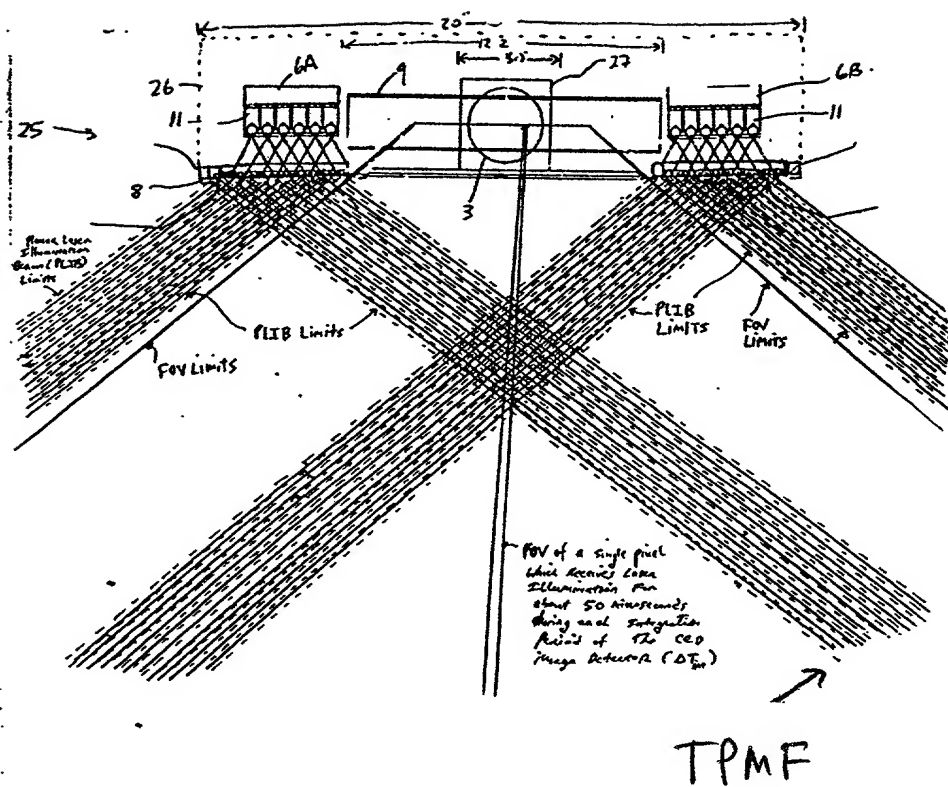


FIG. 1 I 16A

Third Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal *phase* of the transmitted PLIB along the ~~planar extent thereof~~ according to a *Temporal phase* modulation function (TFMF) so as to:

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/6B

100688803-0206002

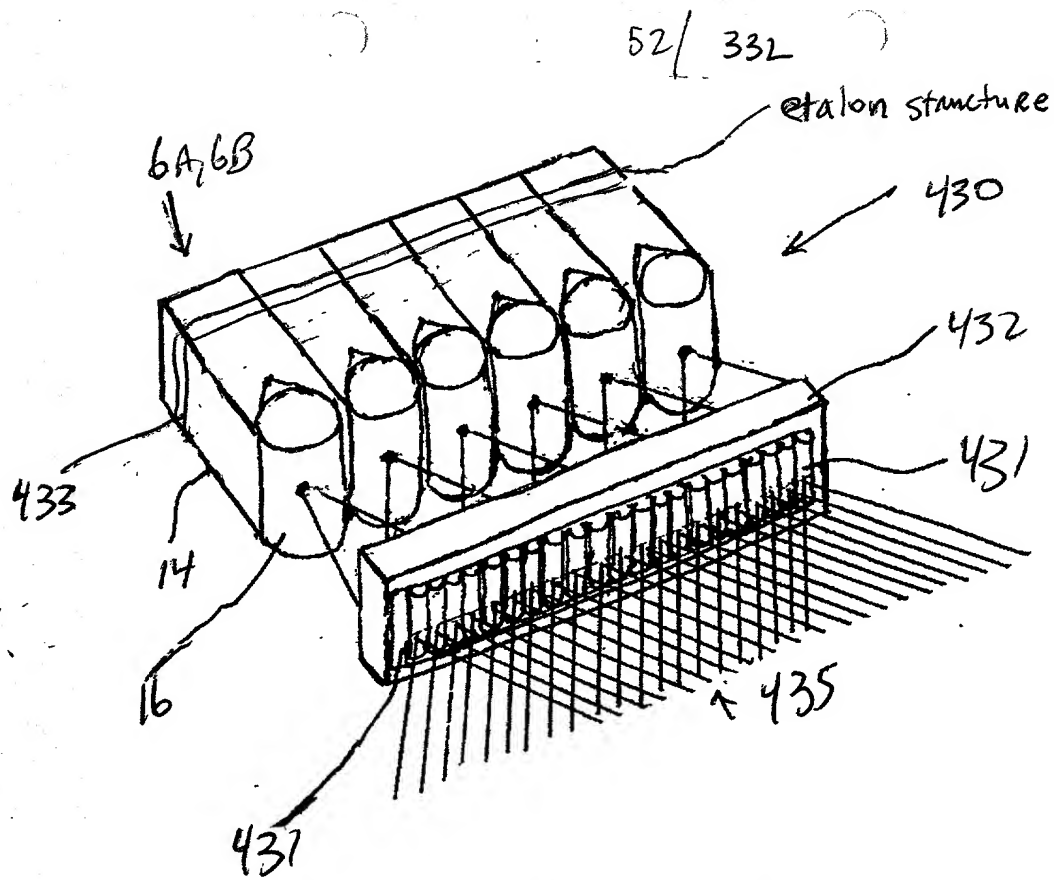


FIG. 1I17A

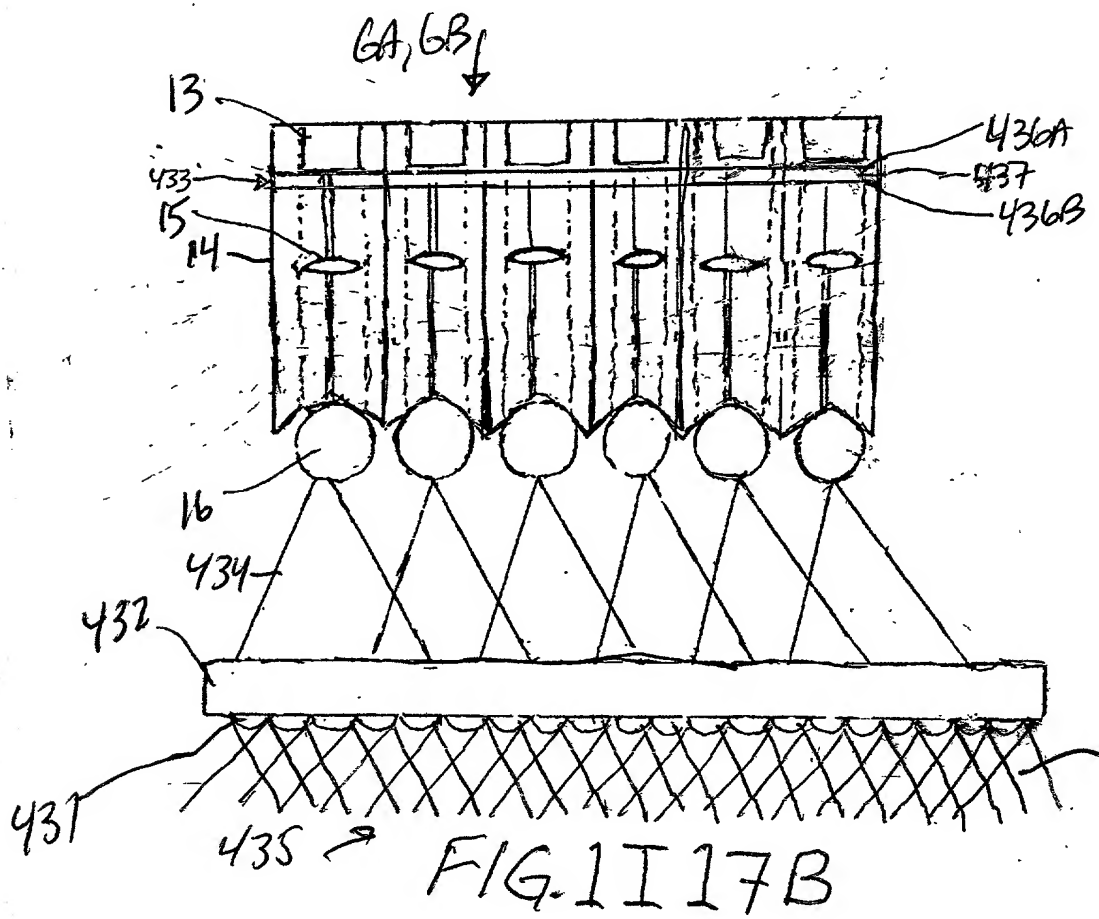
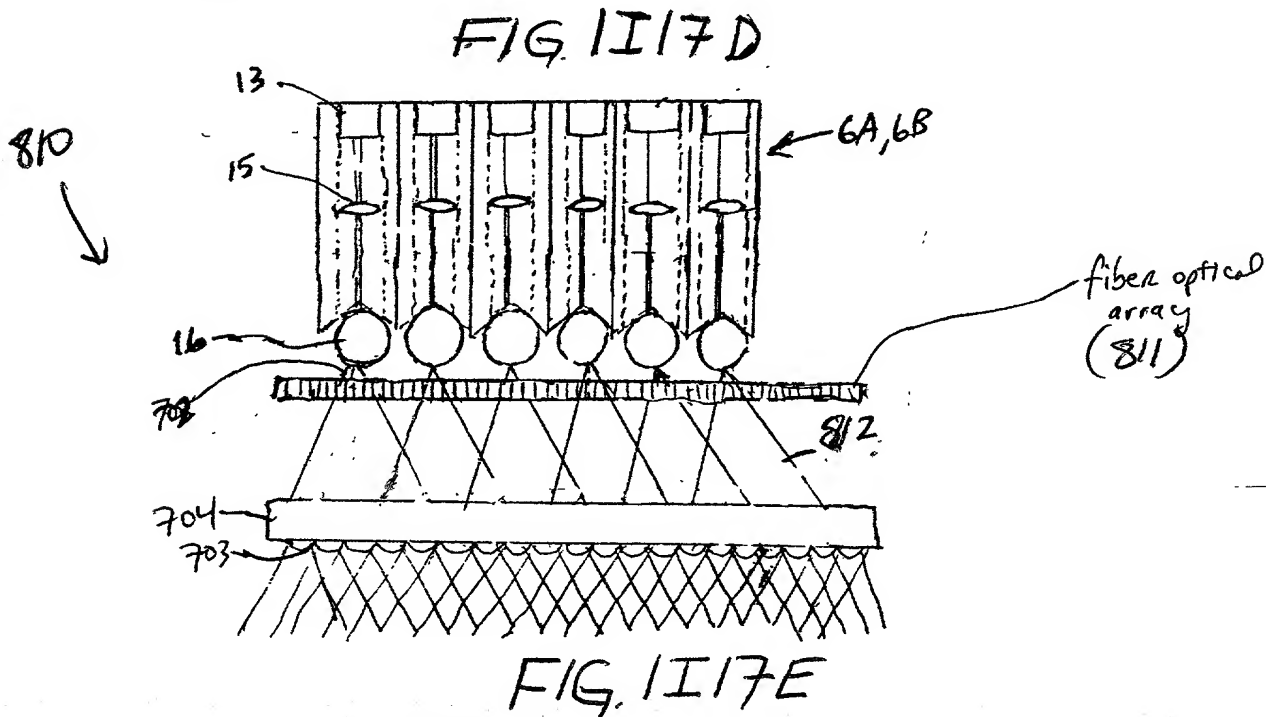
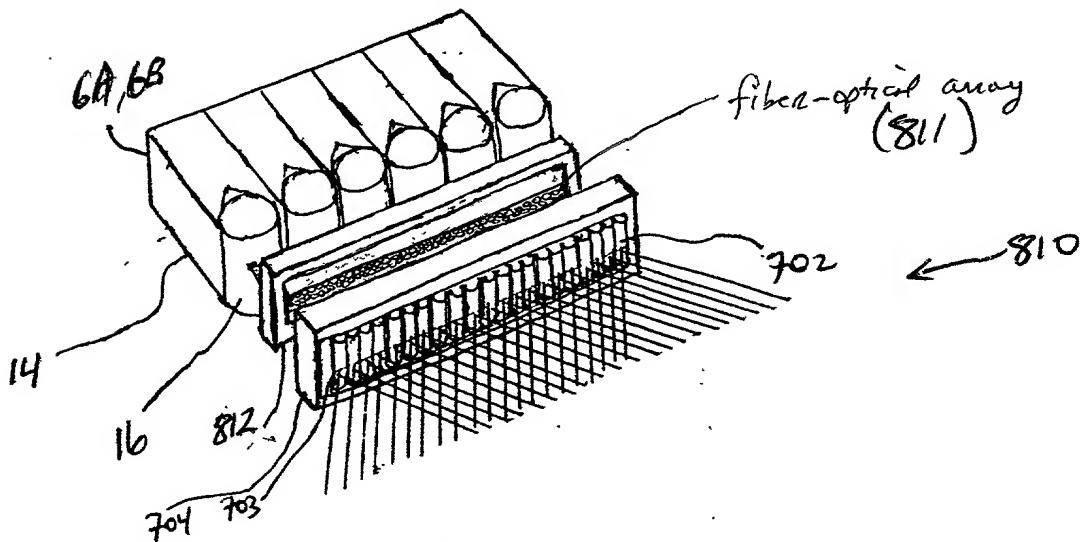
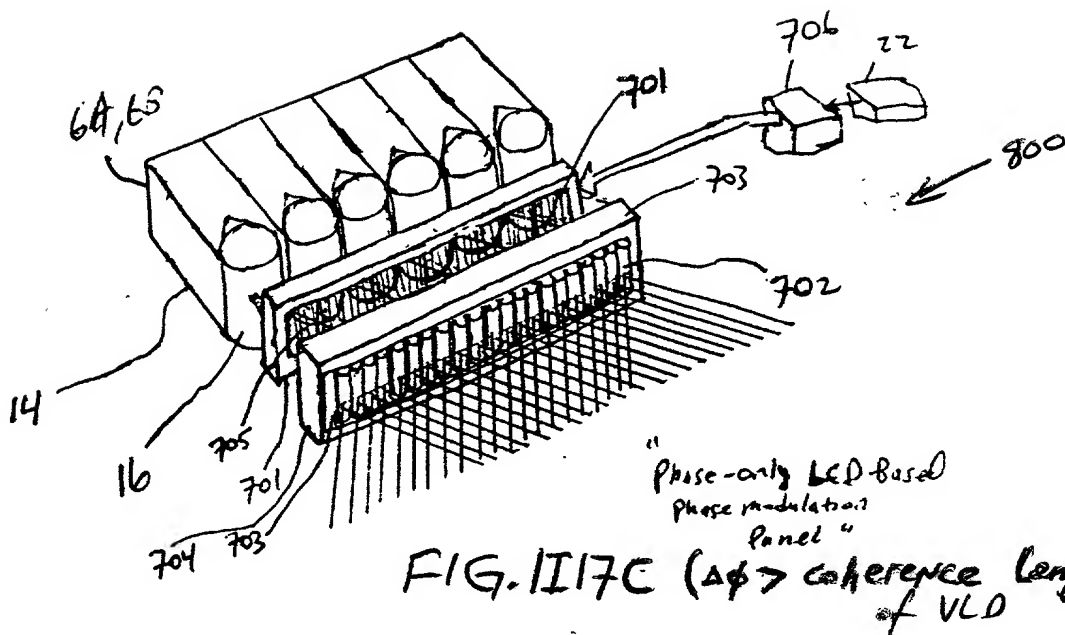
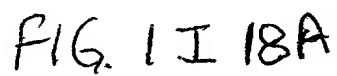


FIG. 1I17B





Fourth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal frequency of the transmitted PLIB according to a temporal intensity modulation function (T IMF) so as to ;

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I18B

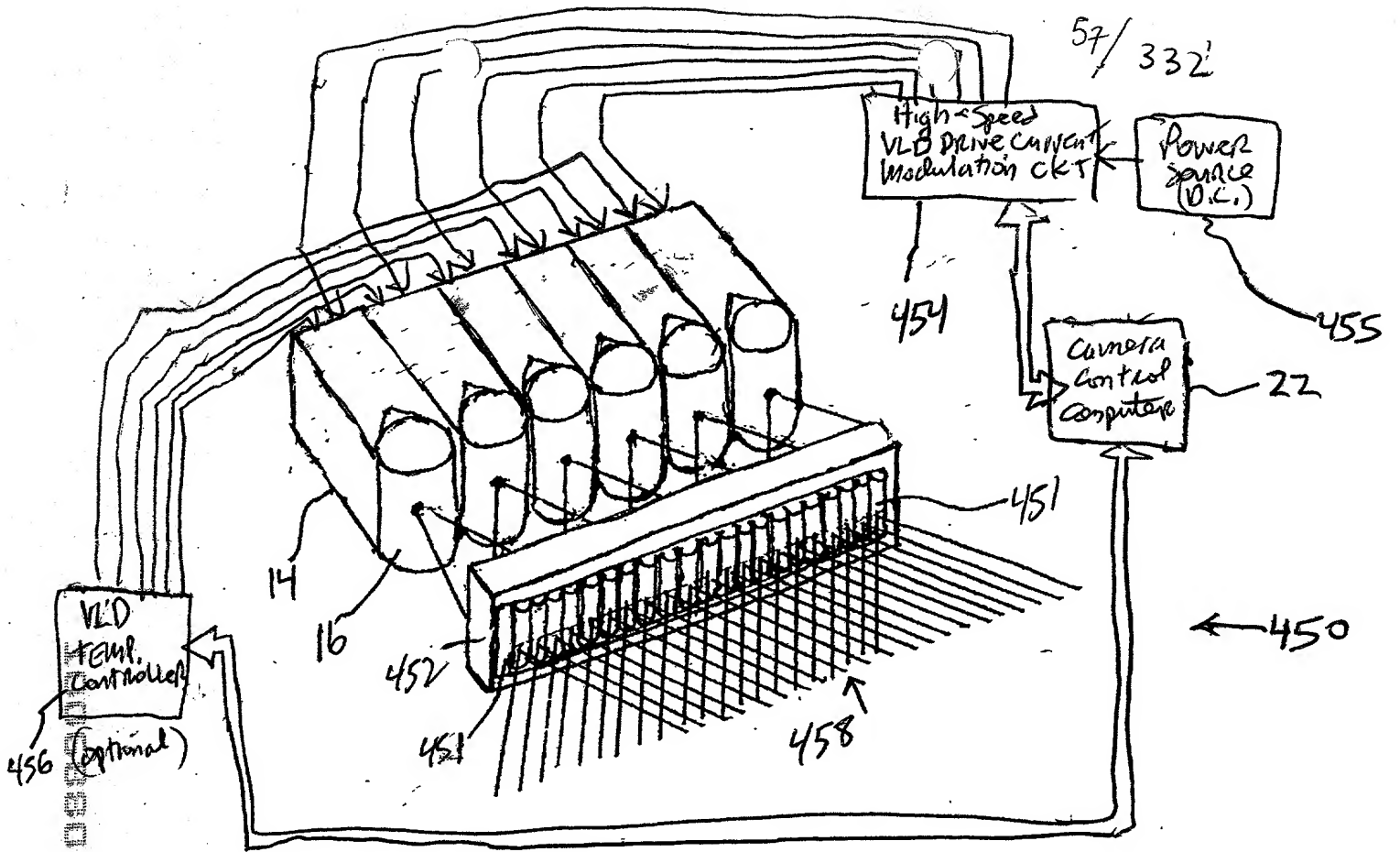


FIG. 1I 19A

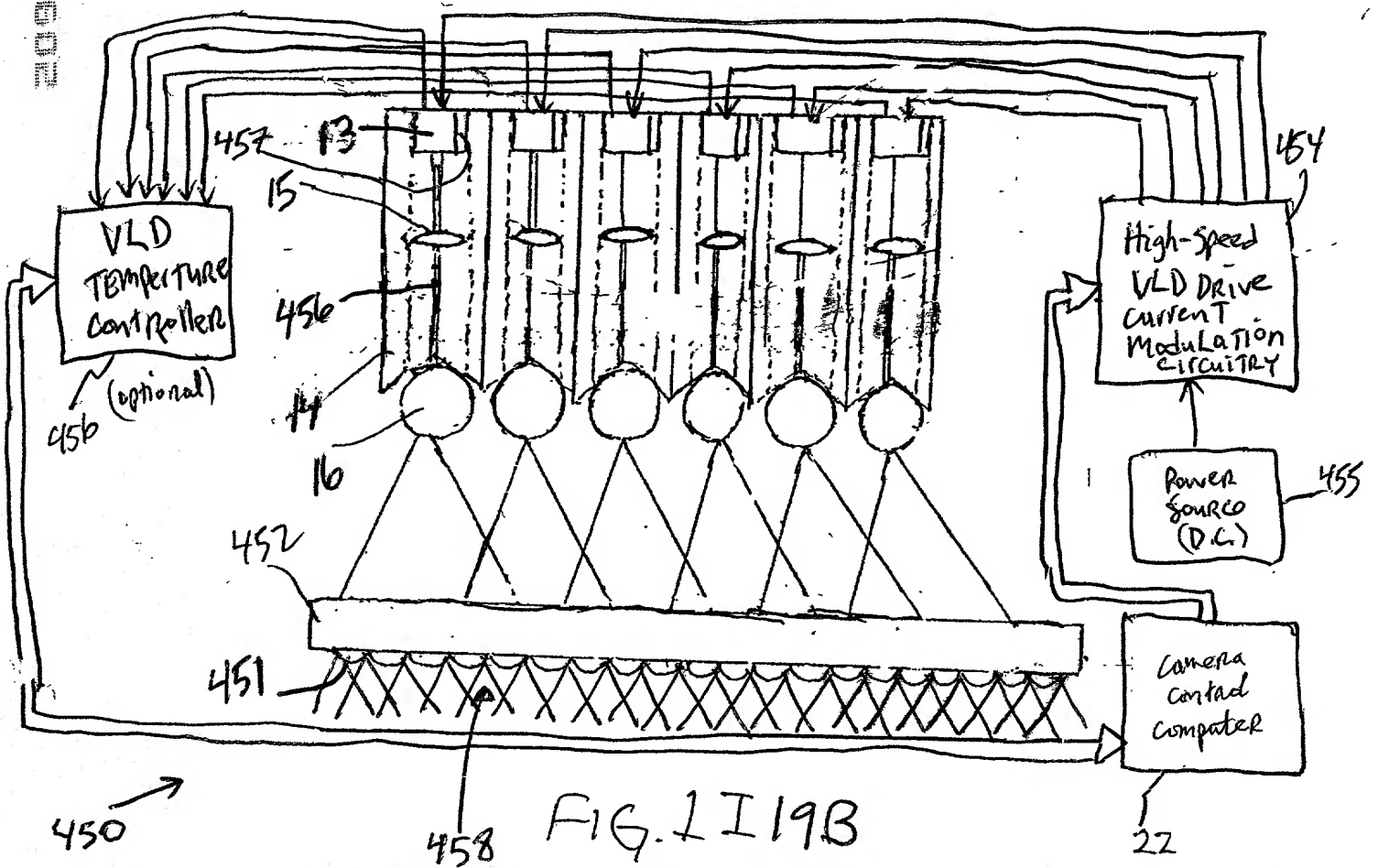


FIG. 1I 19B

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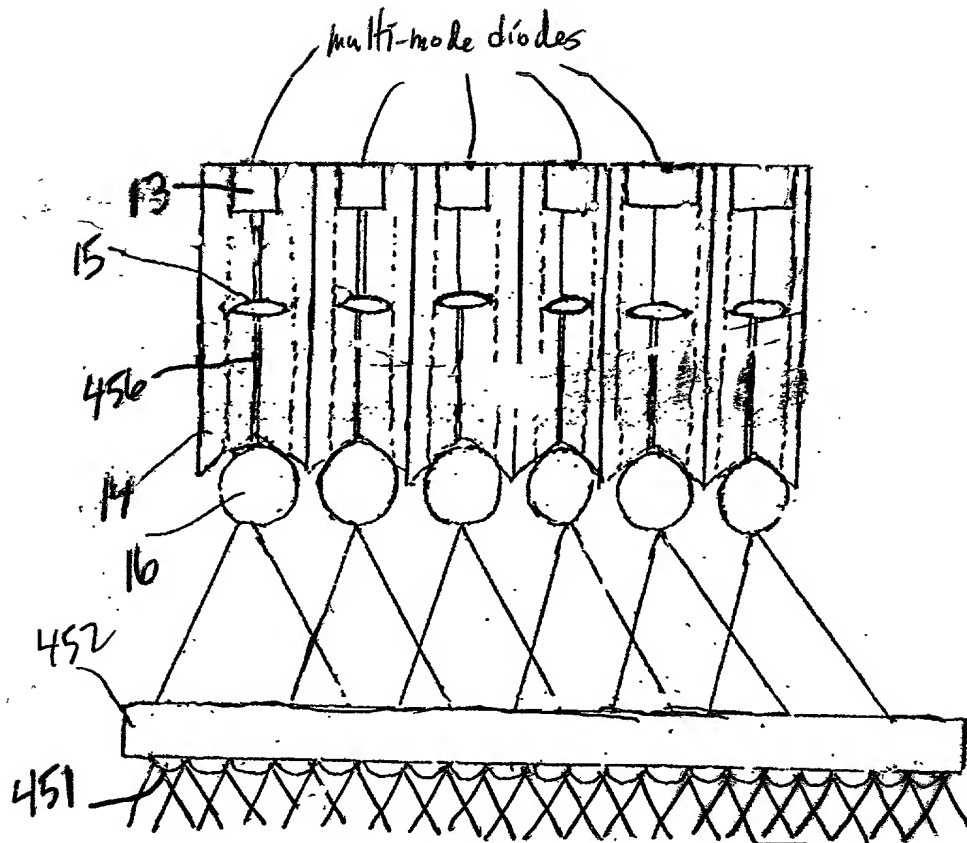


FIG 1I19C

(SINF)

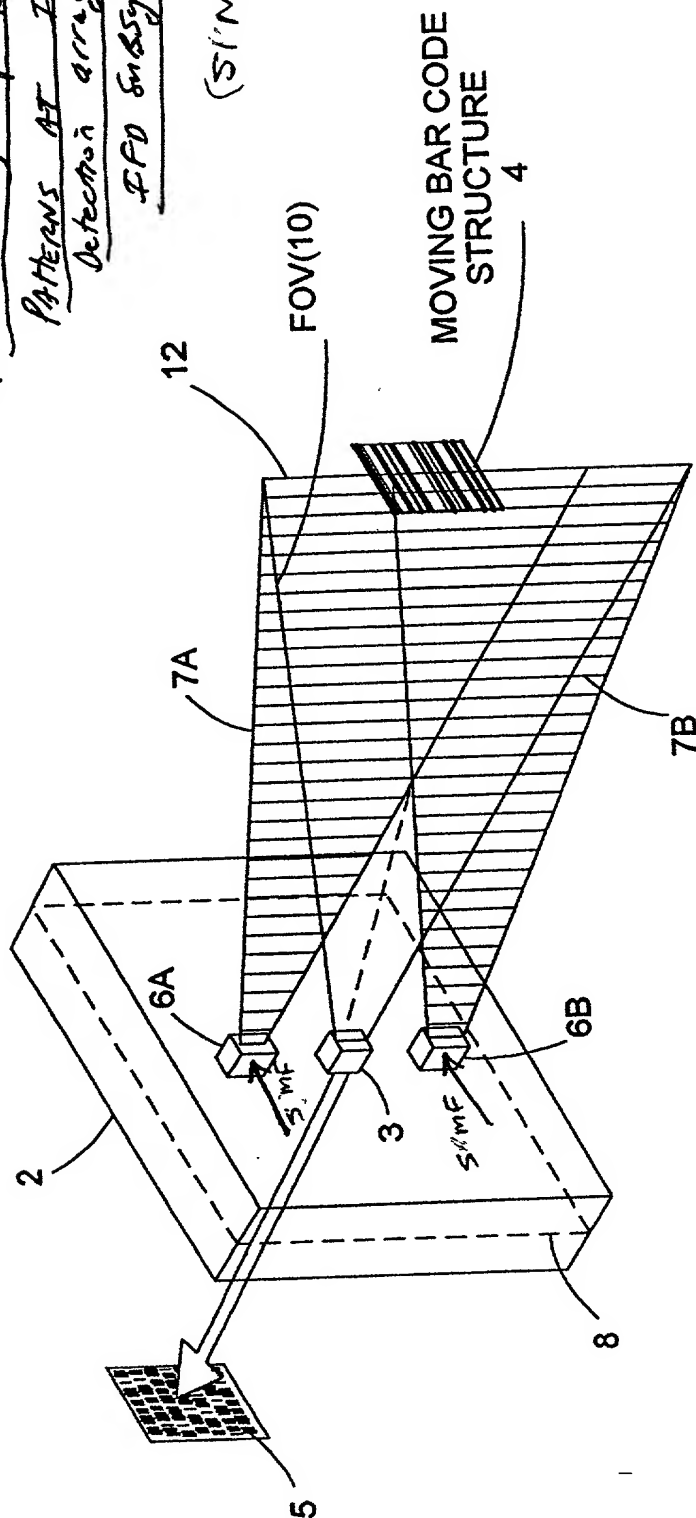


FIG 1F 20

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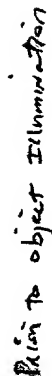


FIG. 1 I ZOA

Fifth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the transmitted PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I20B

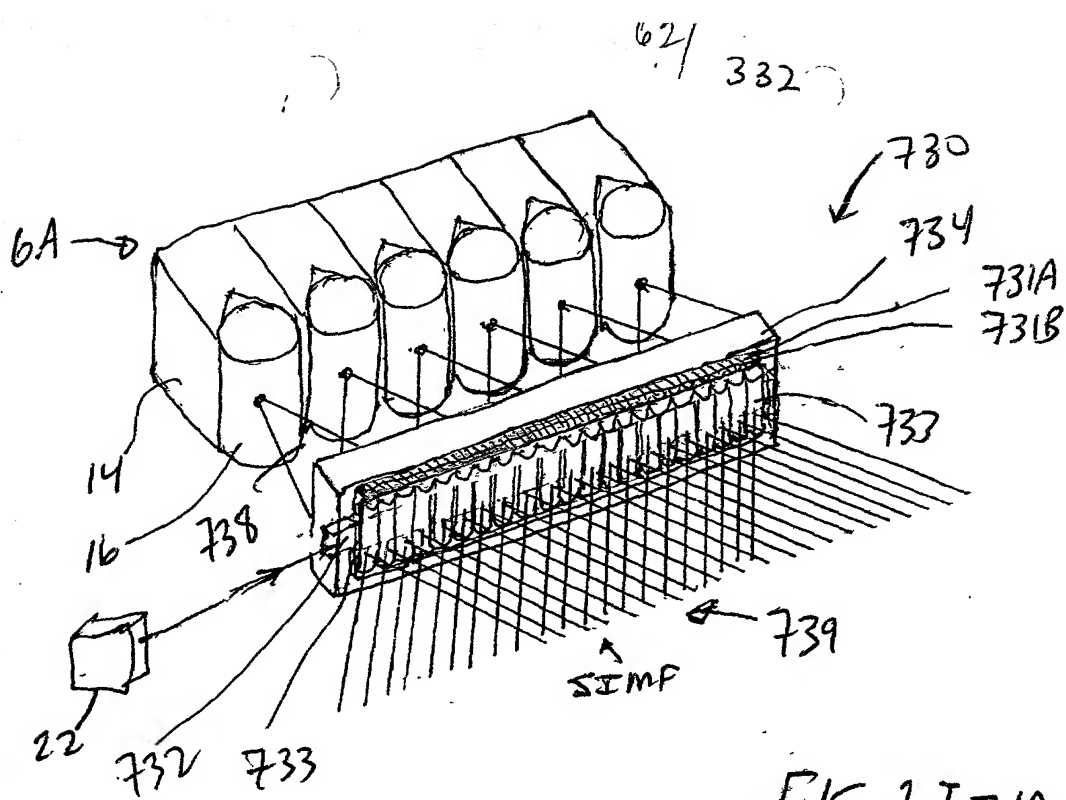


FIG. 1 IZ 1A

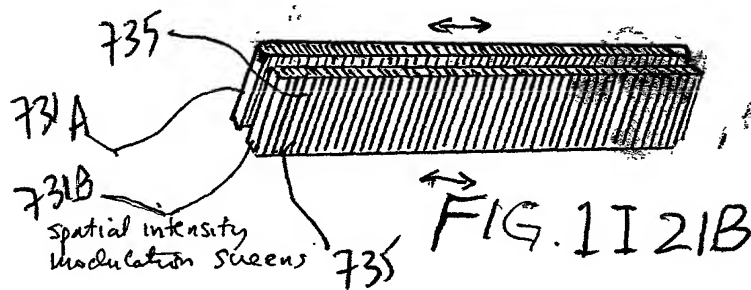


FIG. 1121B

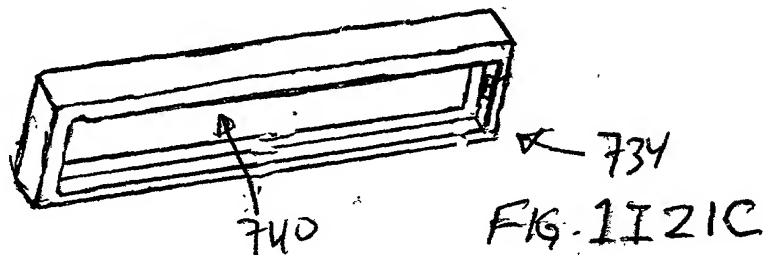


FIG. 1121C

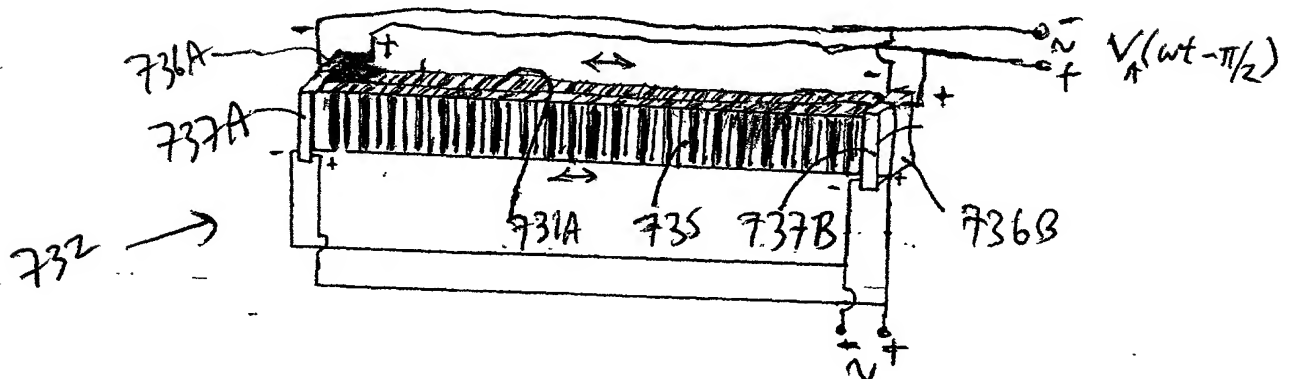


FIG. 11210 V(wt)

Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection array
of the IFD Subsystem

(SIMF)

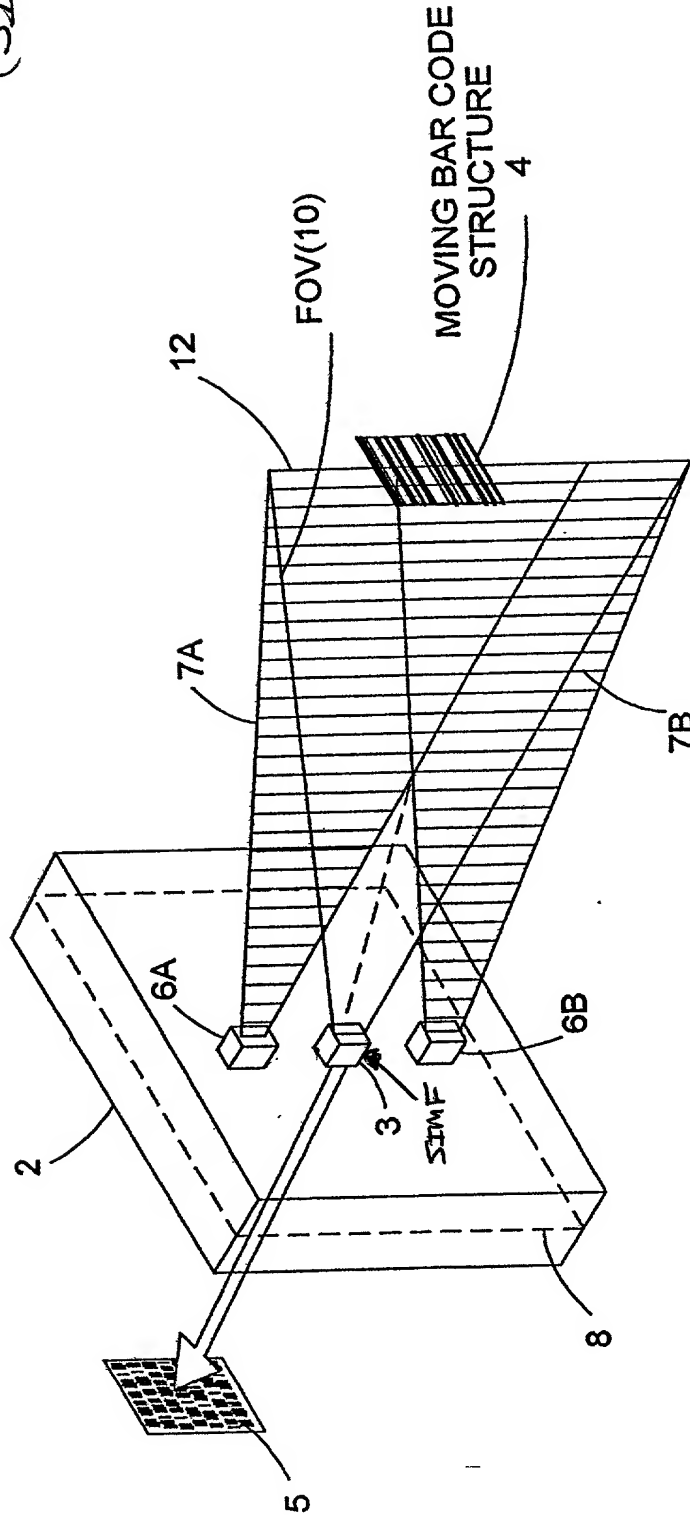


FIG. 1I 22

[illegible]

Sixth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to :

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 22B

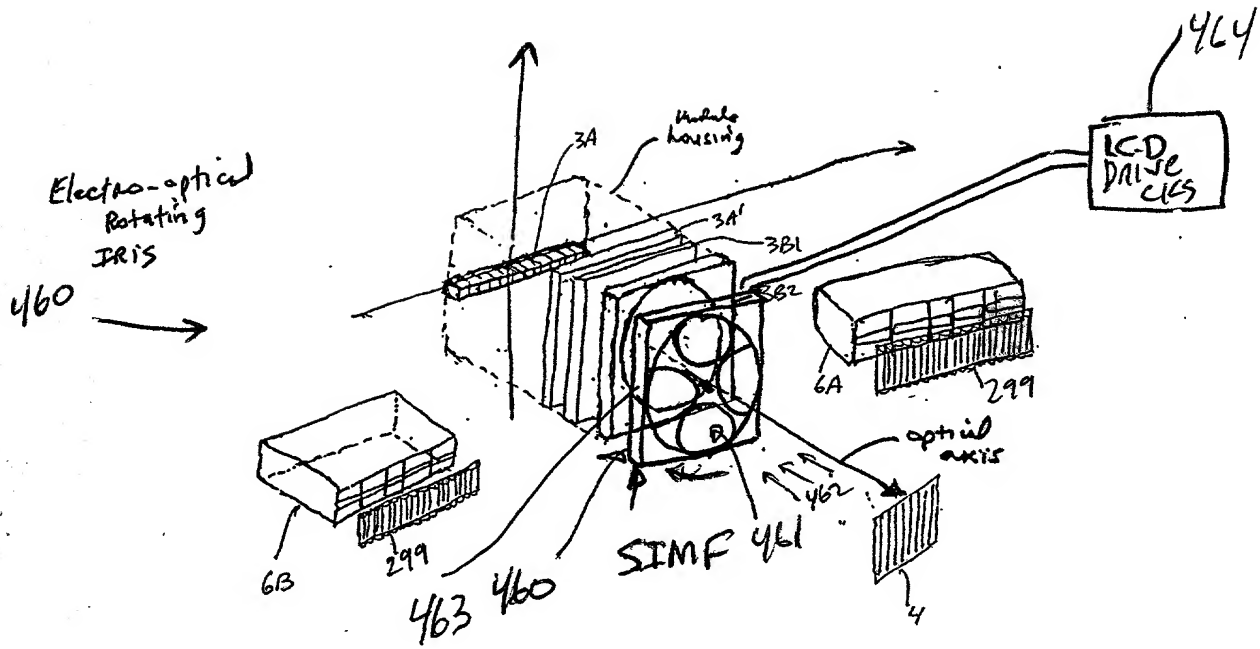


FIG. 1I 23A

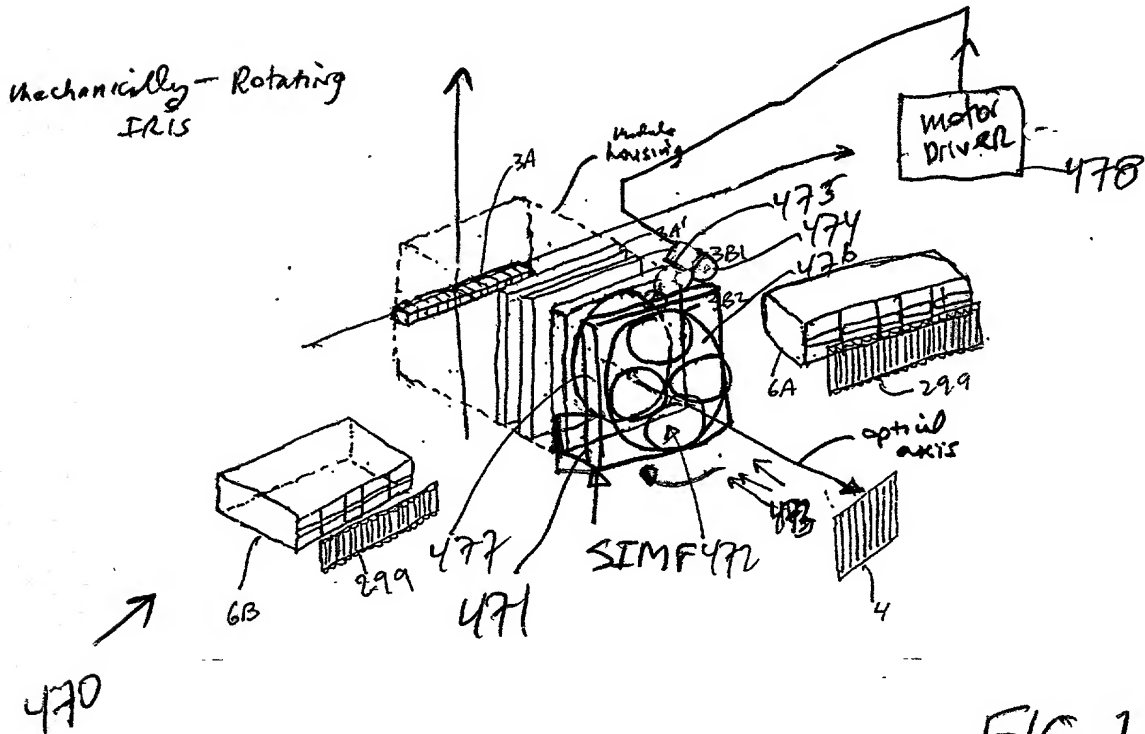


FIG. 1I 23B

Seventh Generalized Method of
Reducing Speckle - Noise Patterns
at Image Detection Array
of the IFD Subsystem

(TIMF)

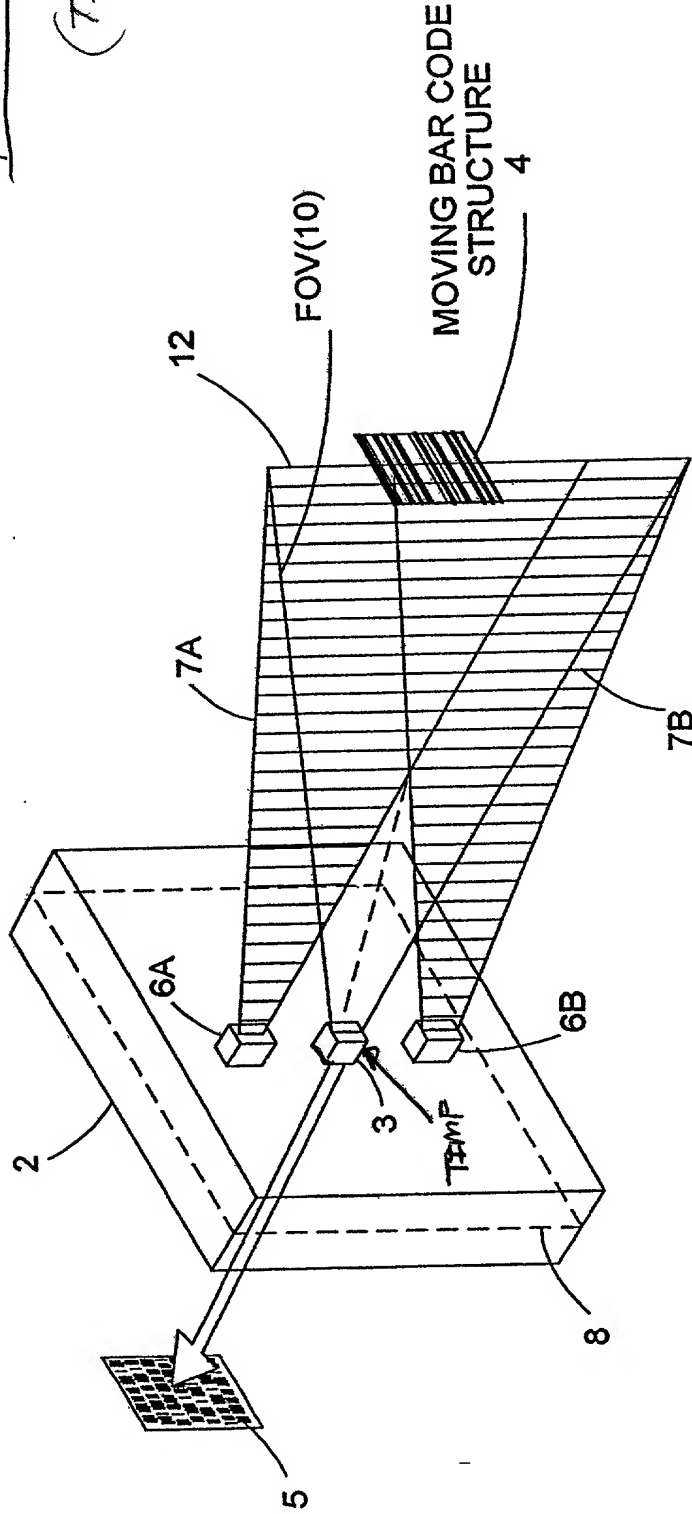


FIG. 1124

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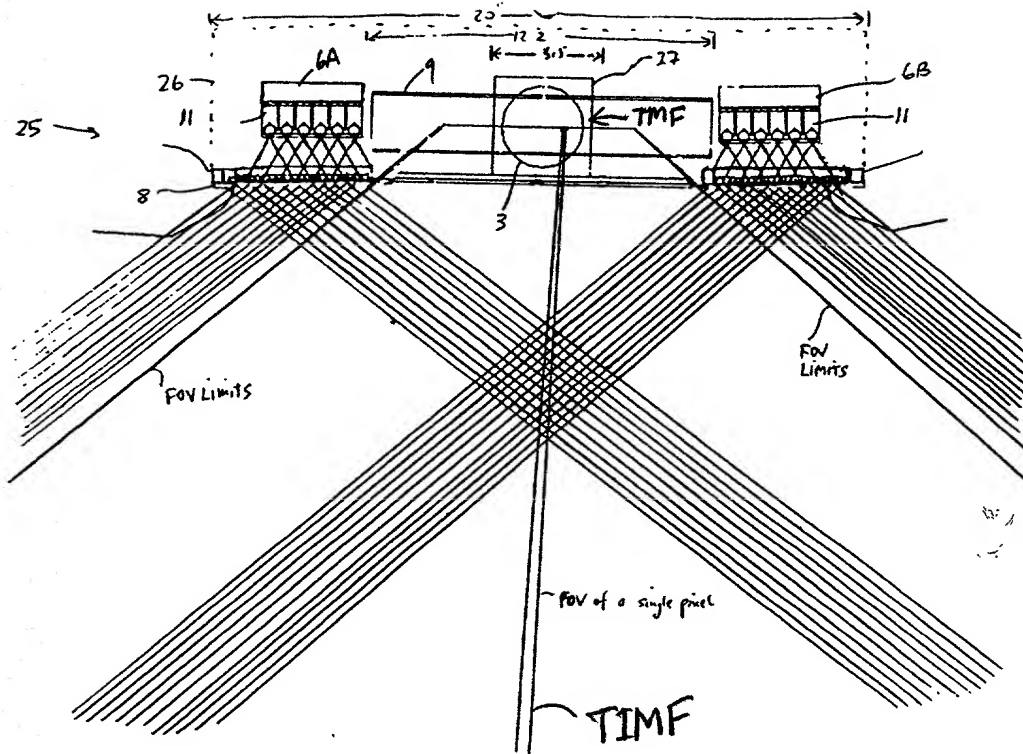


FIG. 1I24A

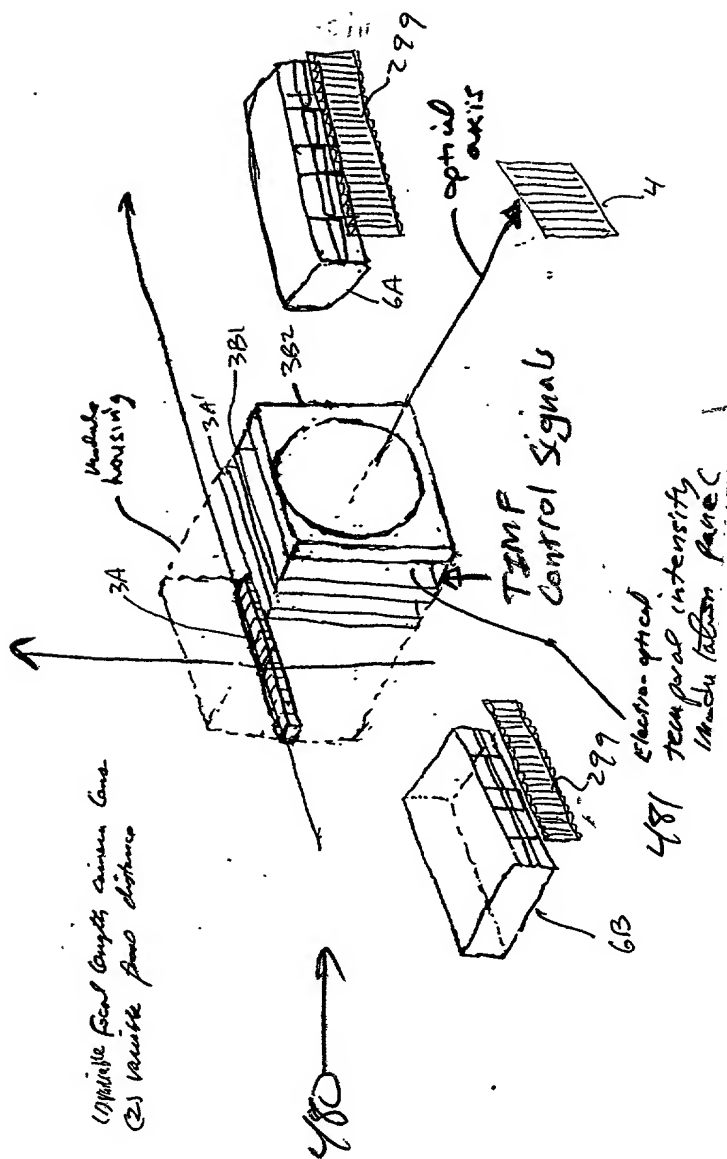
Seventh Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a temporal intensity modulation function (TIME) so as to

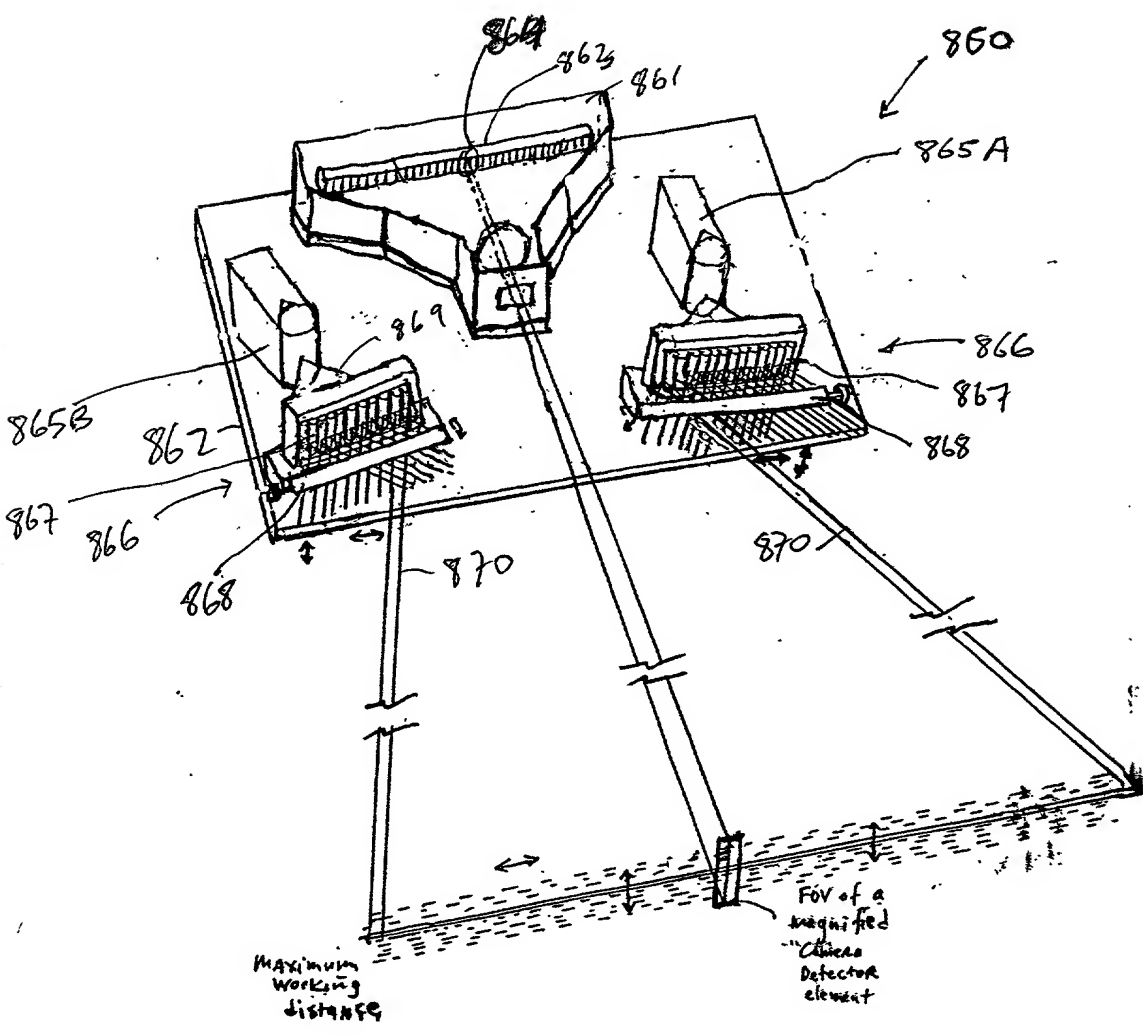
produce many substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 24B



AG 1124C



* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25A1

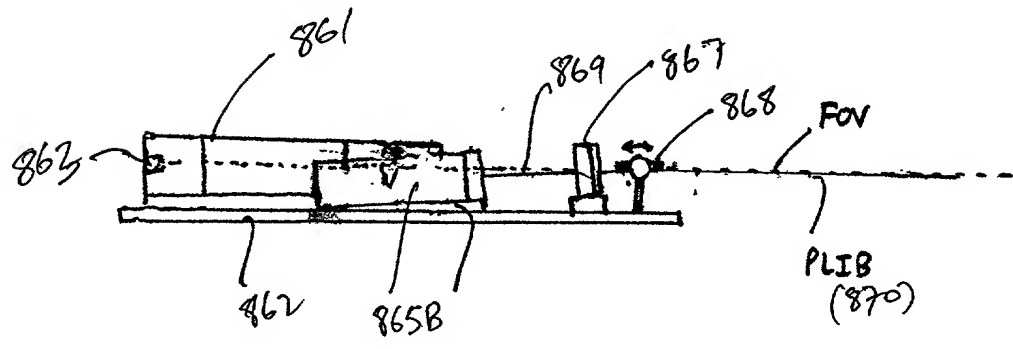


FIG. 1I25A2

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10053303-020502

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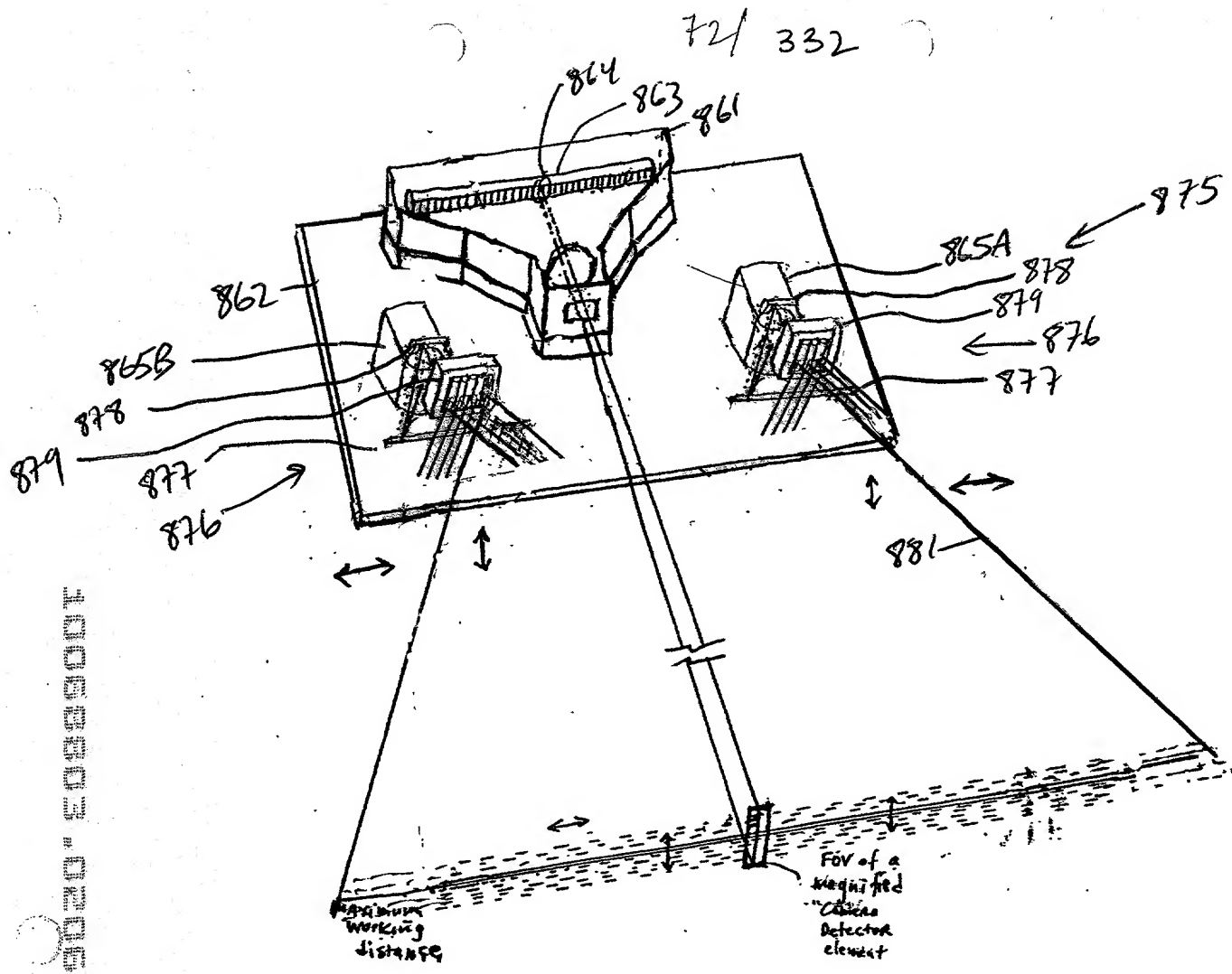


FIG. 1I25B1

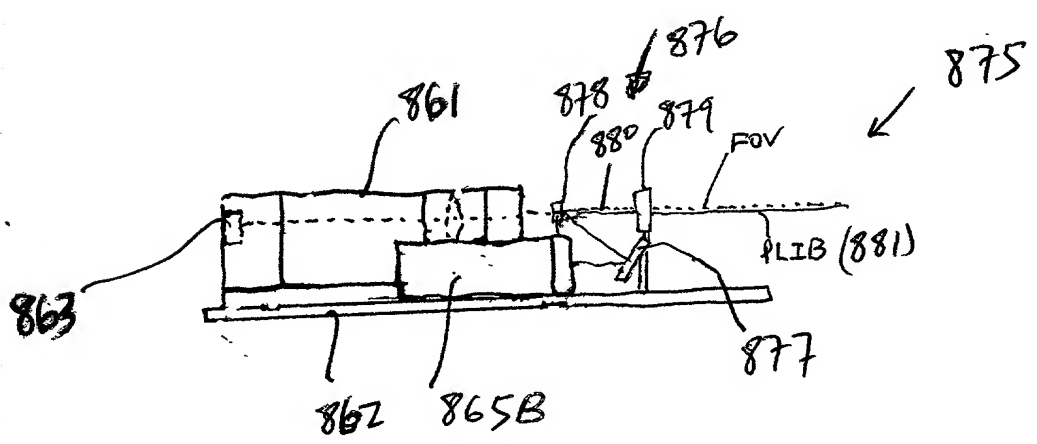


FIG. 1I25B2

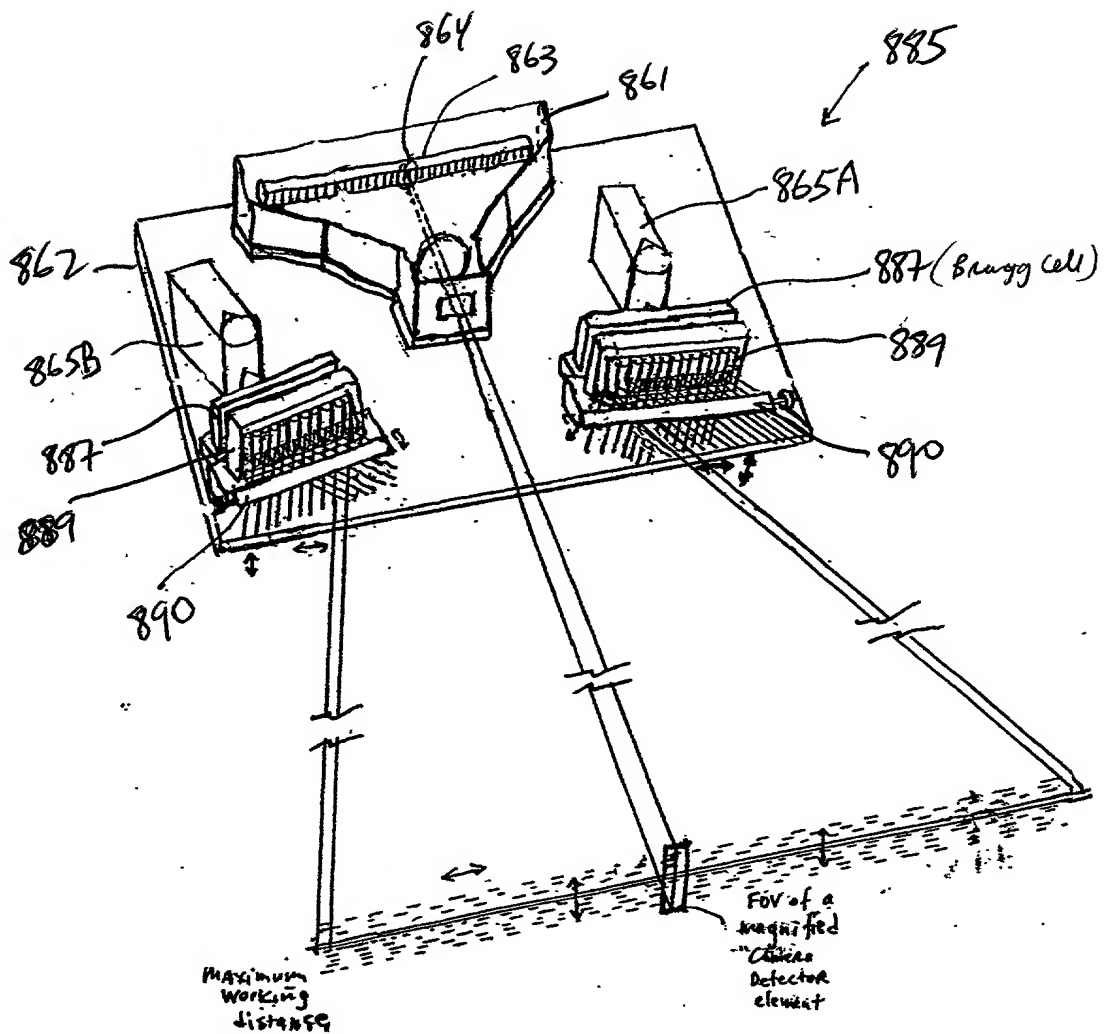


FIG. 1I25C1

* Lateral and Transverse Microoscillation of PLIB

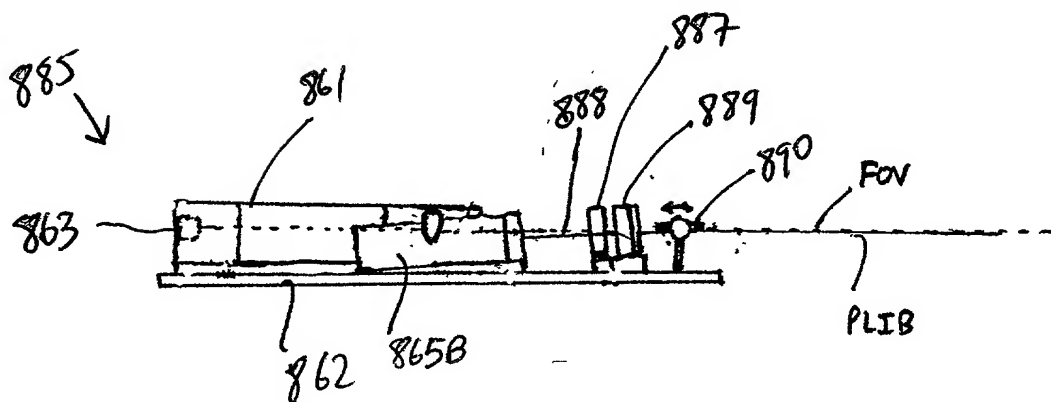


FIG. 1I25C2

209902-0089001

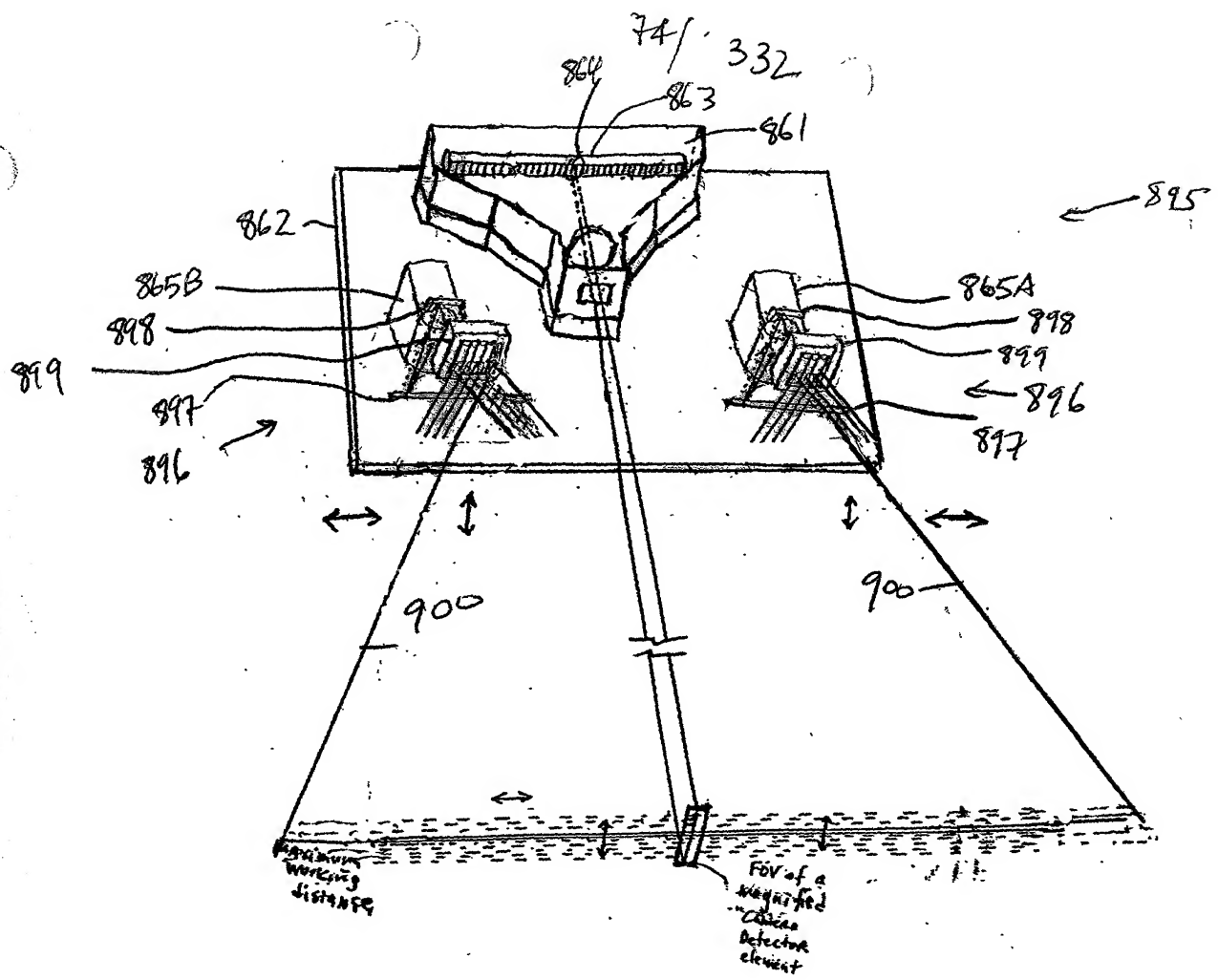


FIG. 1 I 25 D1

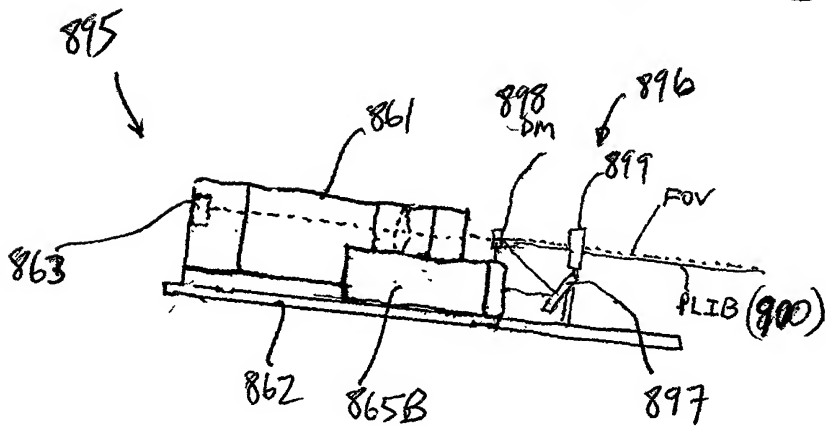


FIG. 1 I 25 D2

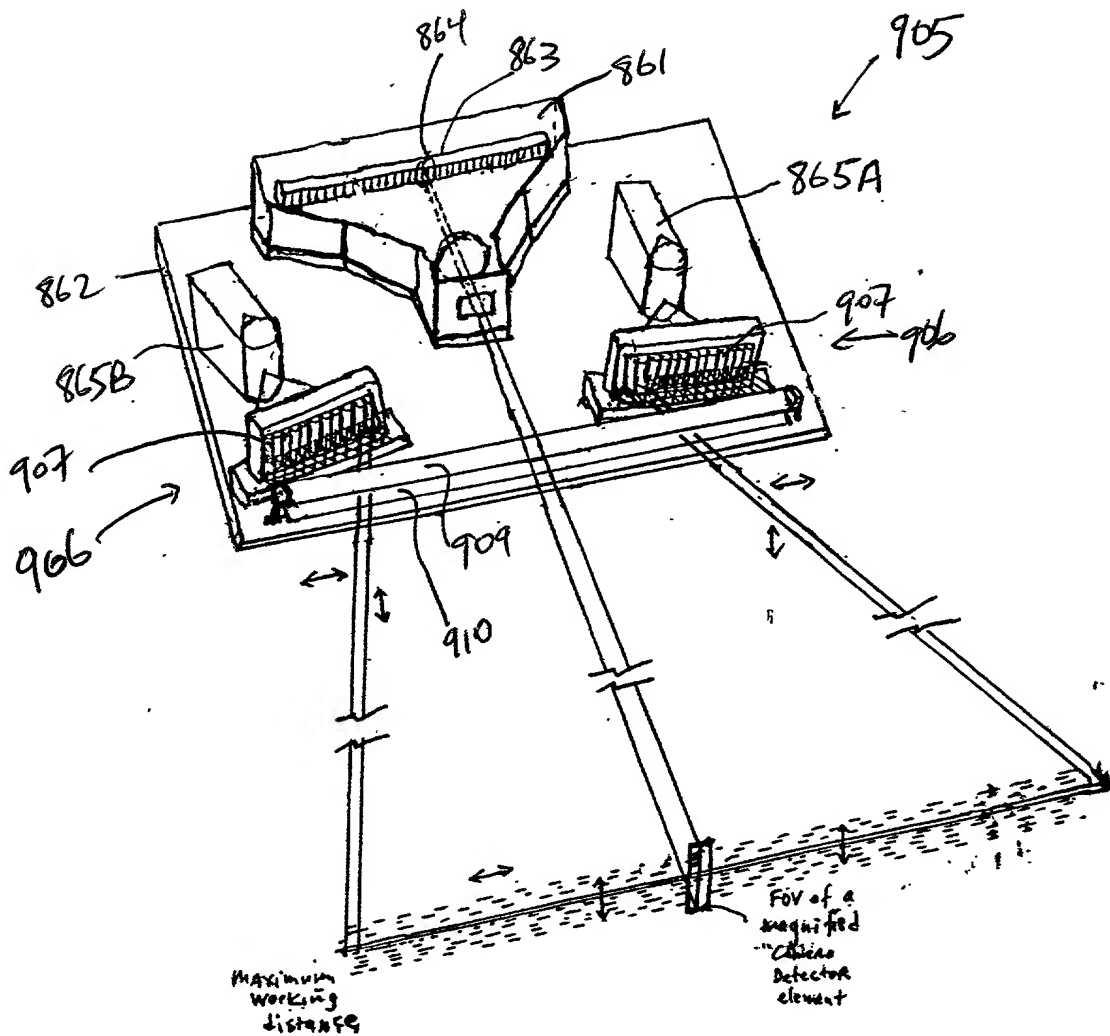


FIG. 1I25E1

* Lateral and Transverse Microoscillation of PLB

905

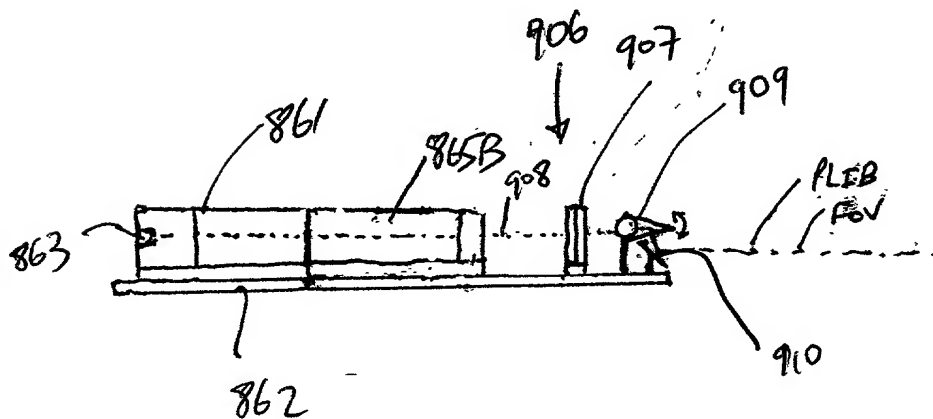
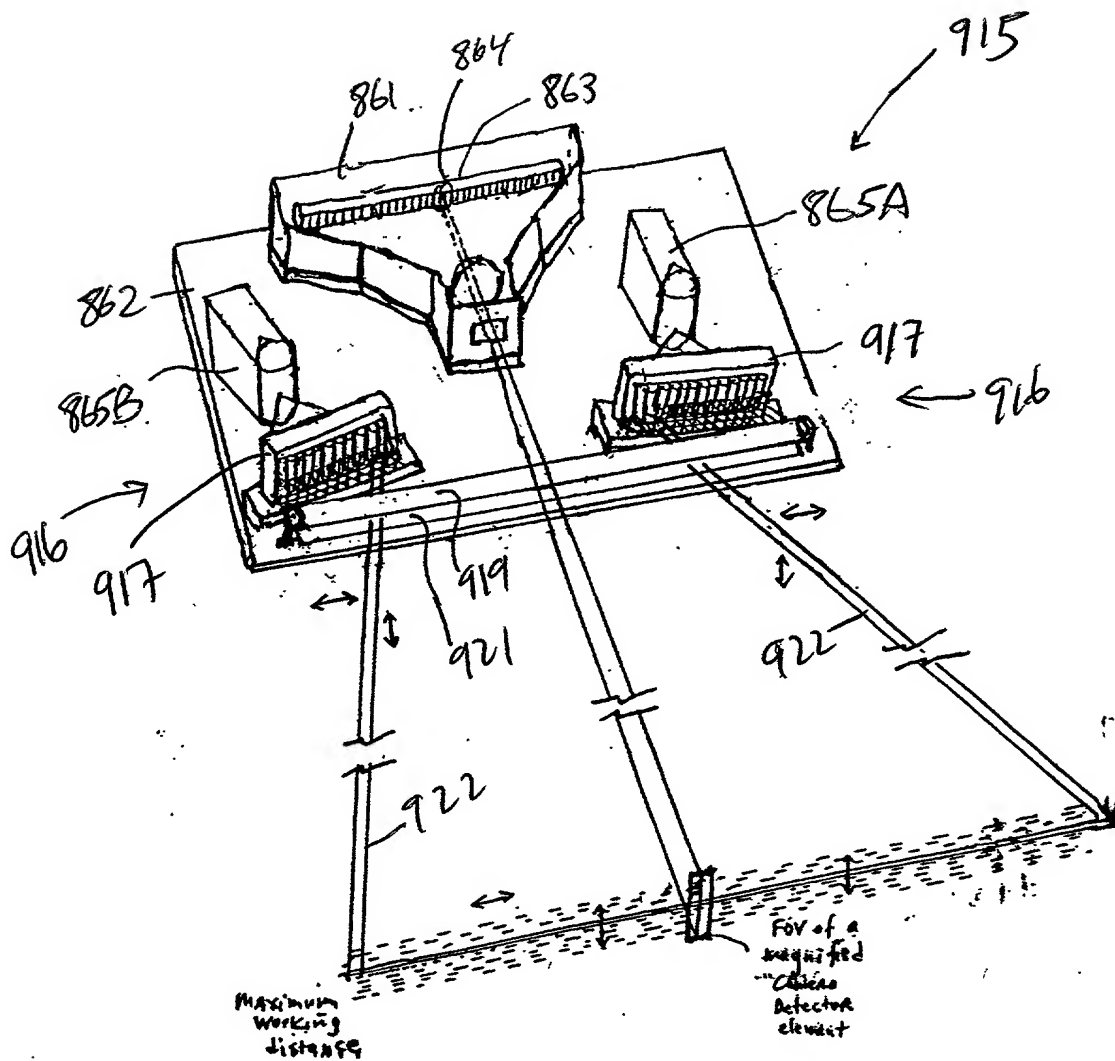


FIG. 1I25E2



* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25F1

915

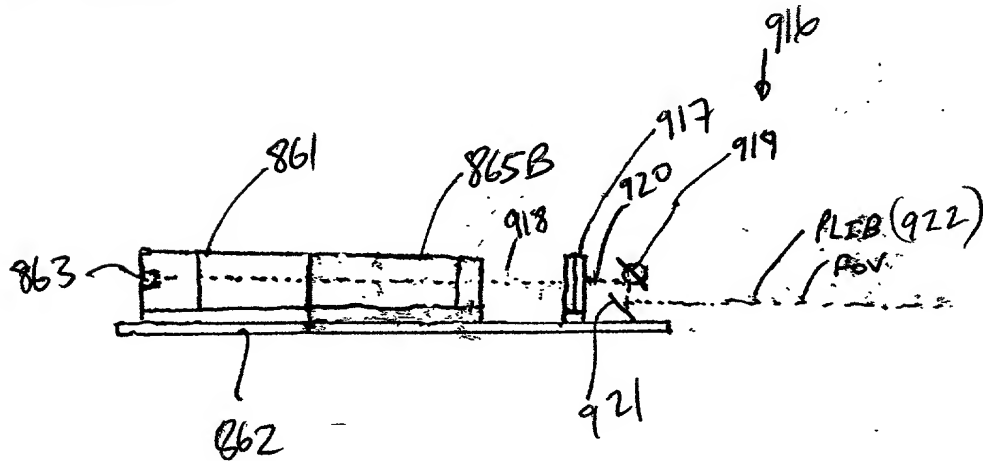
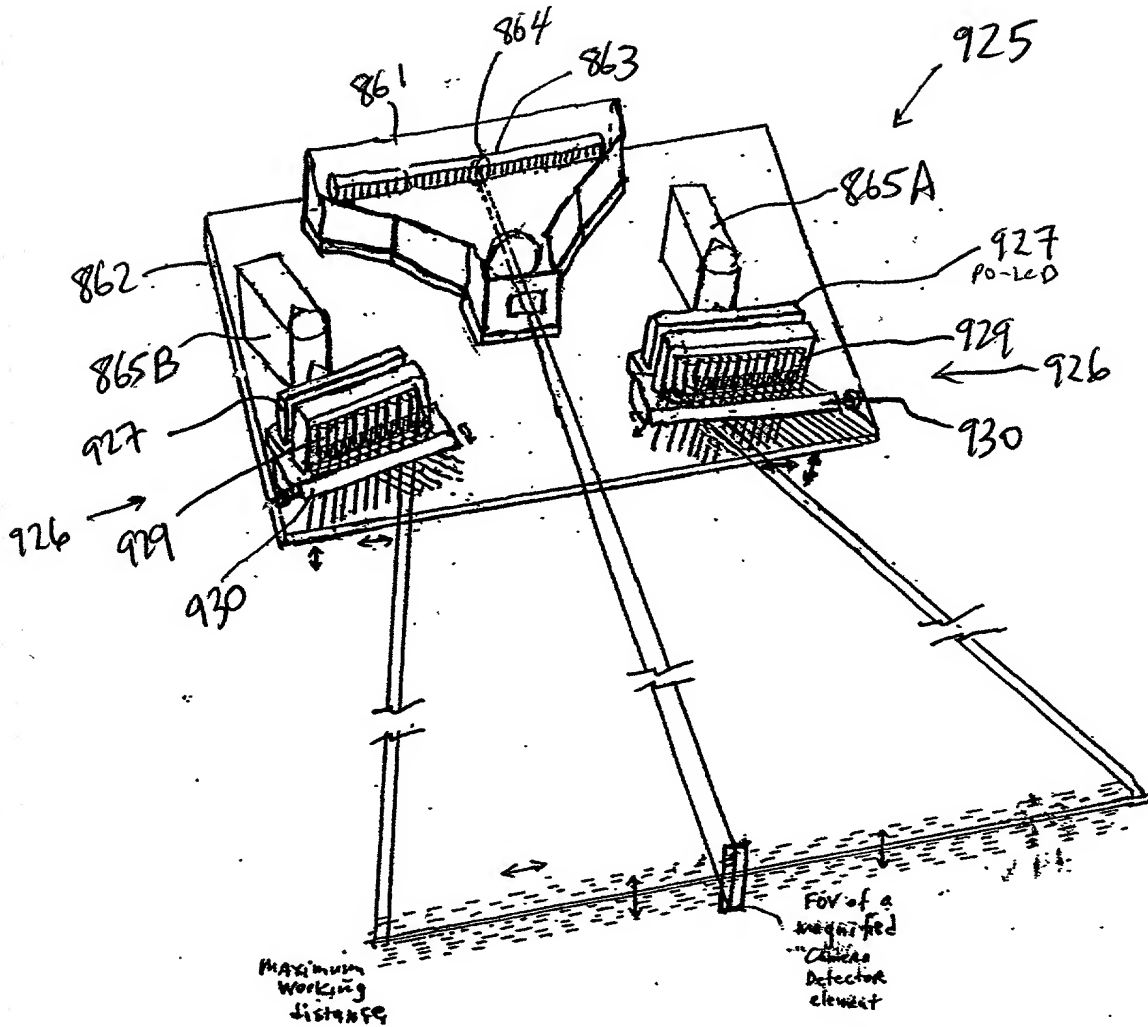


FIG. 1I25F2



* Lateral and Transverse Microoscillation of PLIB

925

FIG. 1I25G1

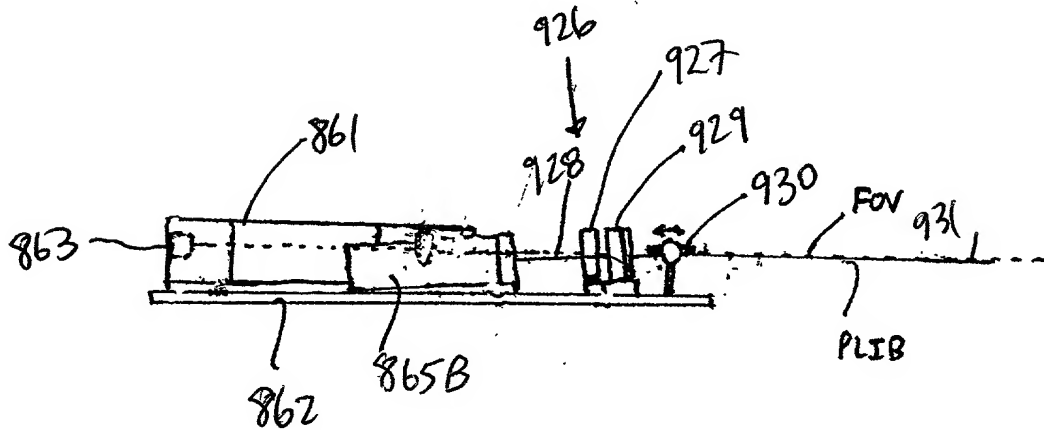
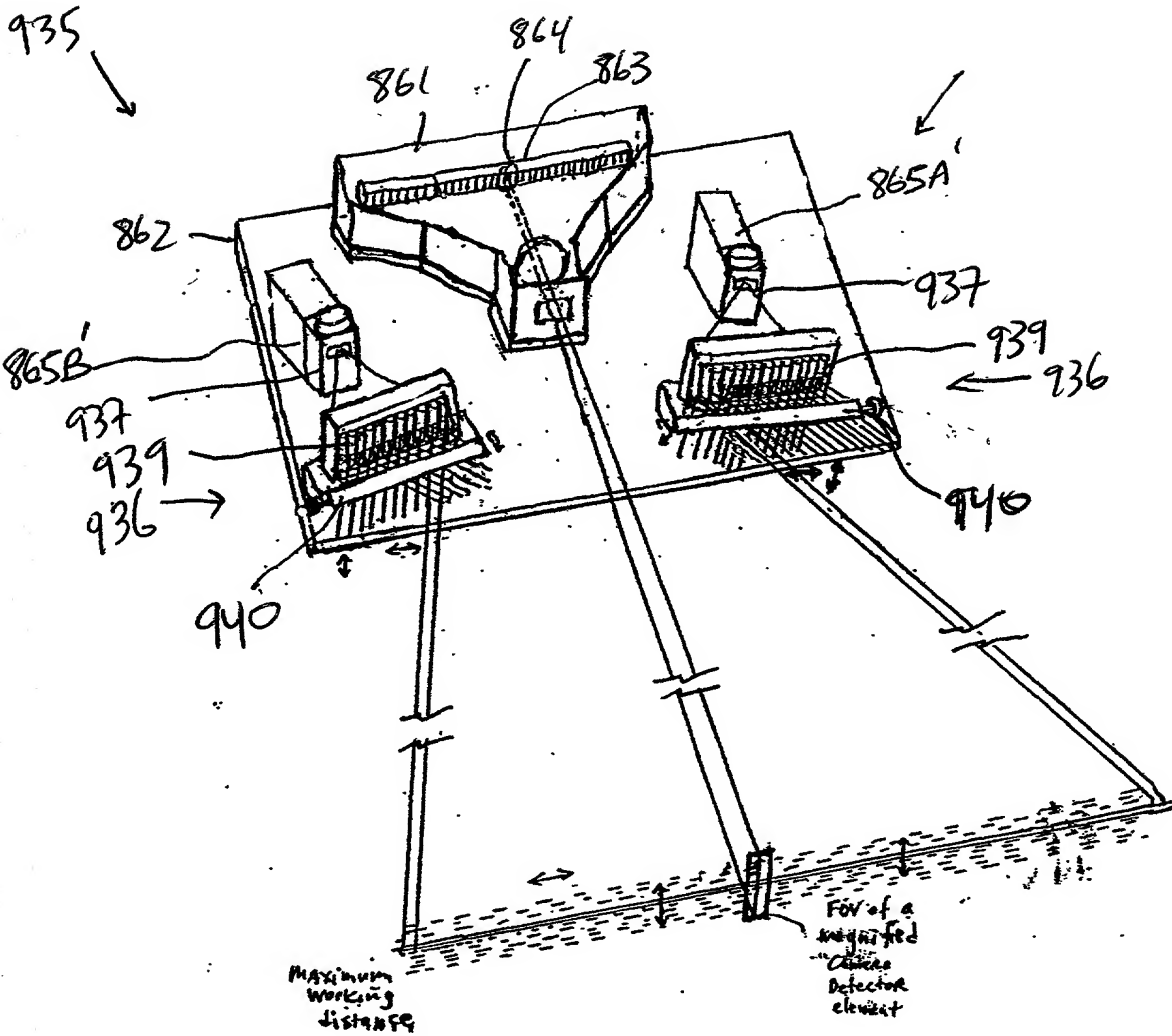


FIG. 1I25G2

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* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25 H1

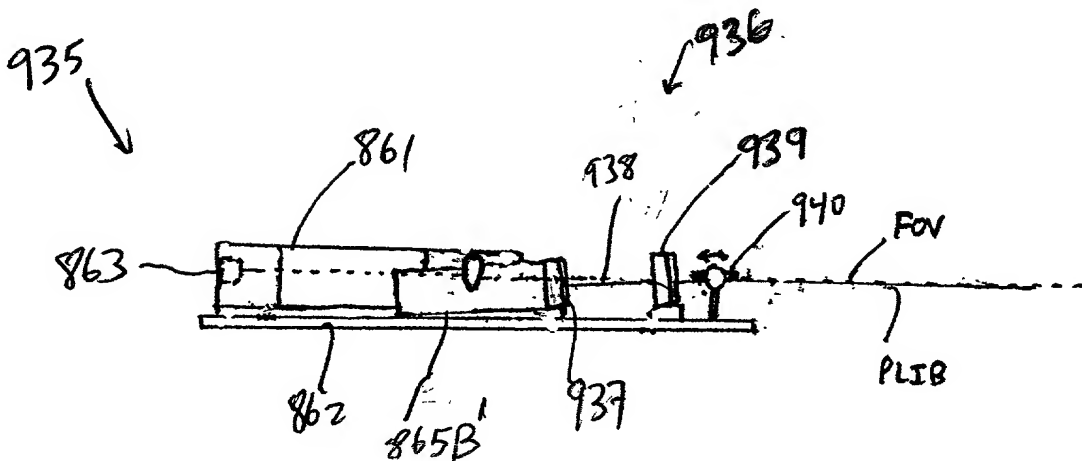
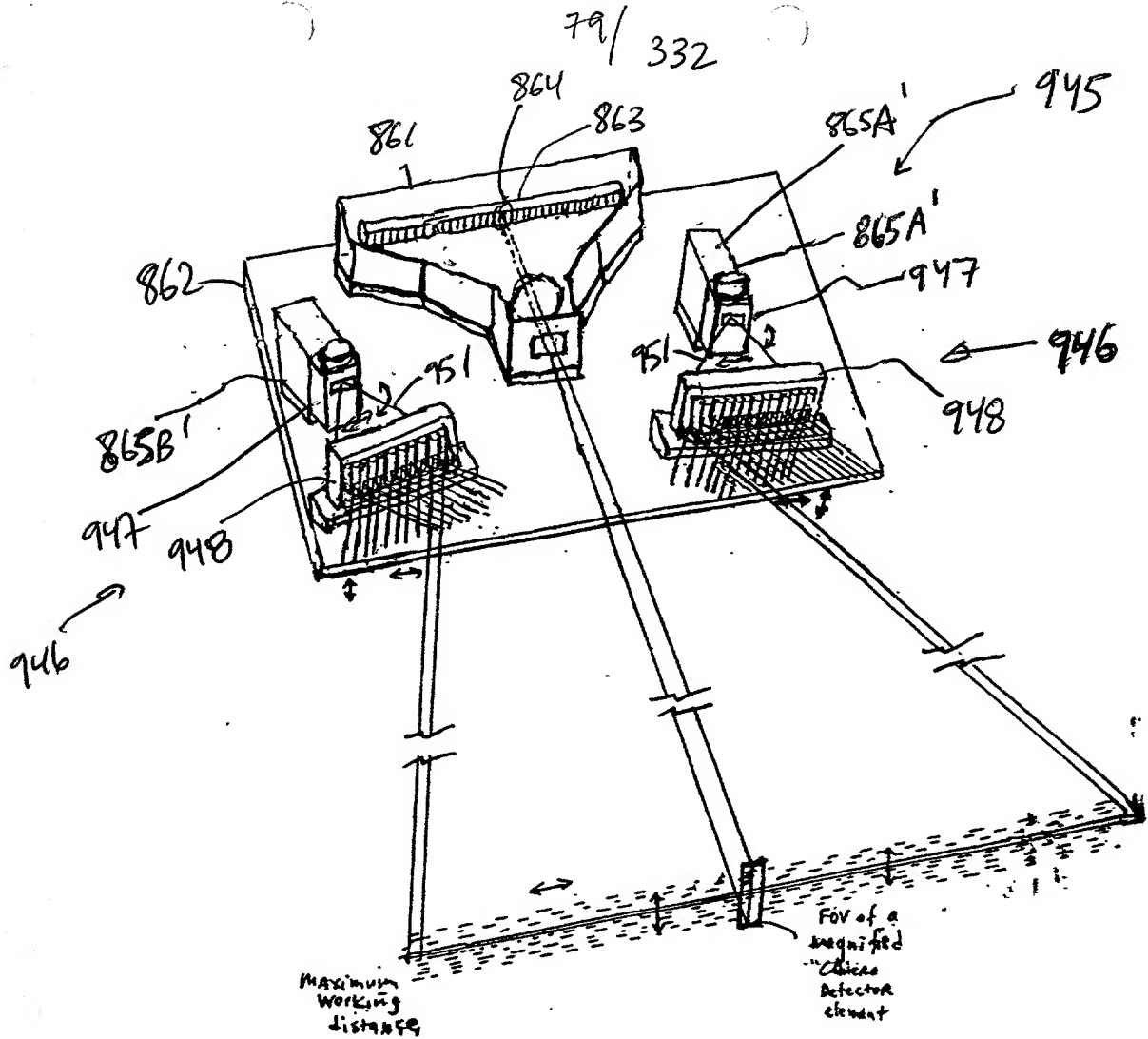


FIG. 1I25 H2

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Lateral and Transverse Oscillation of ALIB

FIG. 1I25I1

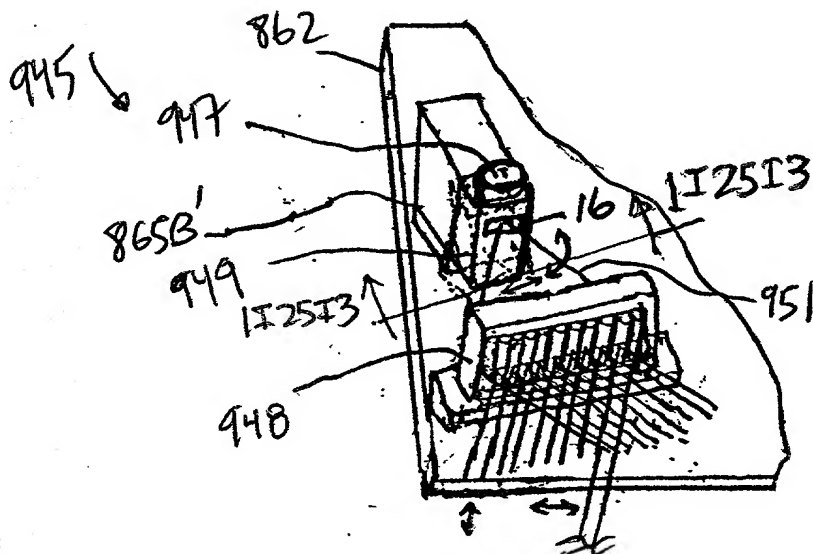


FIG. 1I25I2

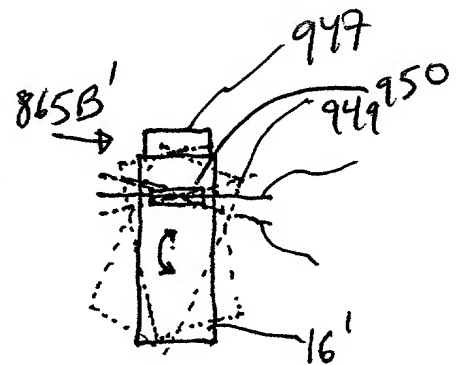


FIG. 1I25I3

10068803 10068803

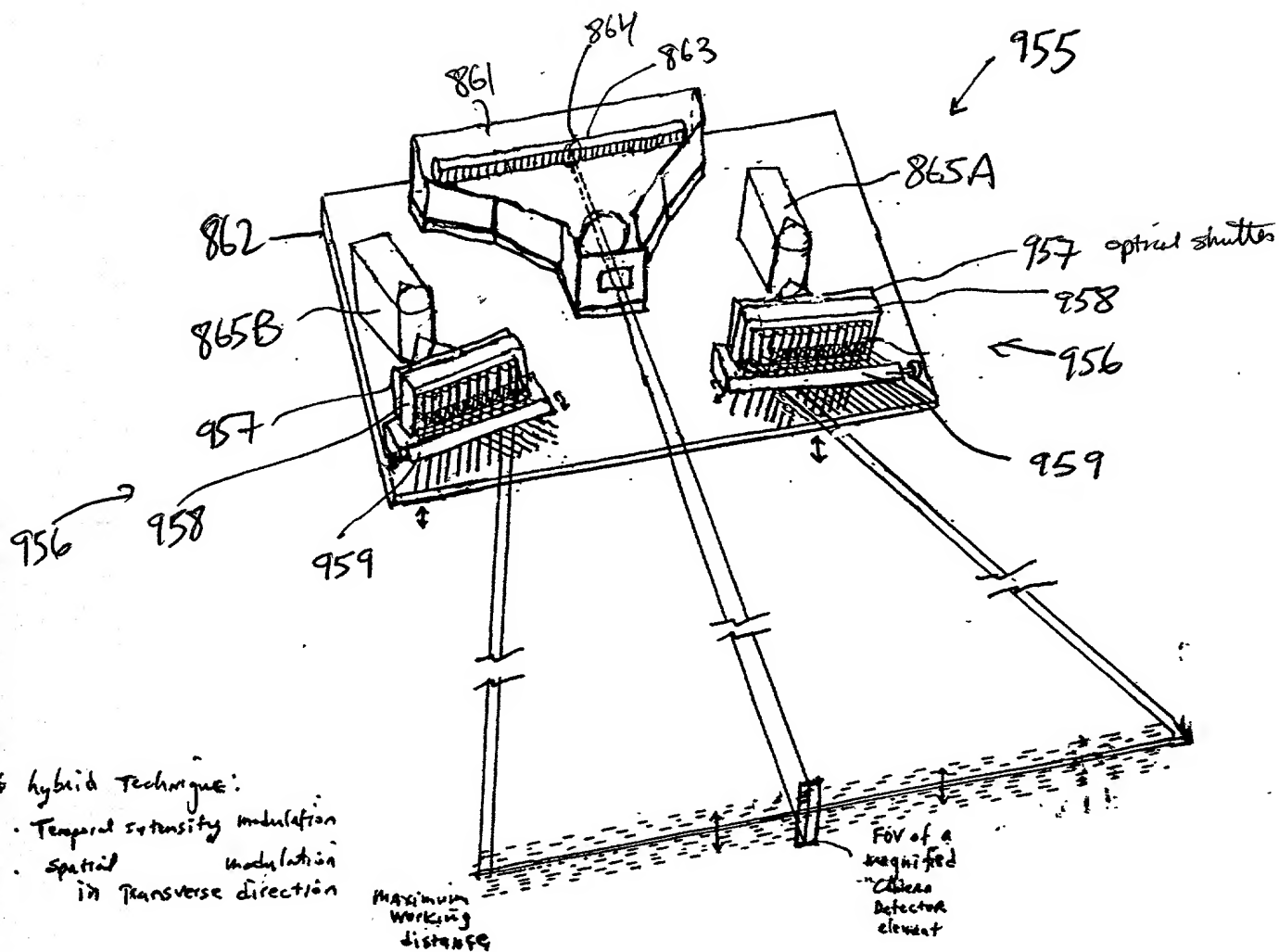


FIG. 1I25J1

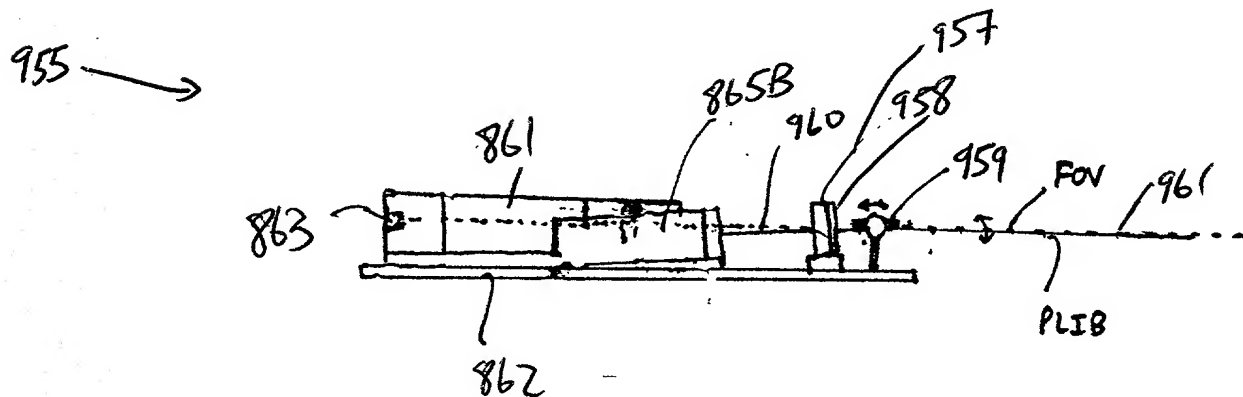


FIG. 1I25J2

10066803-0006002

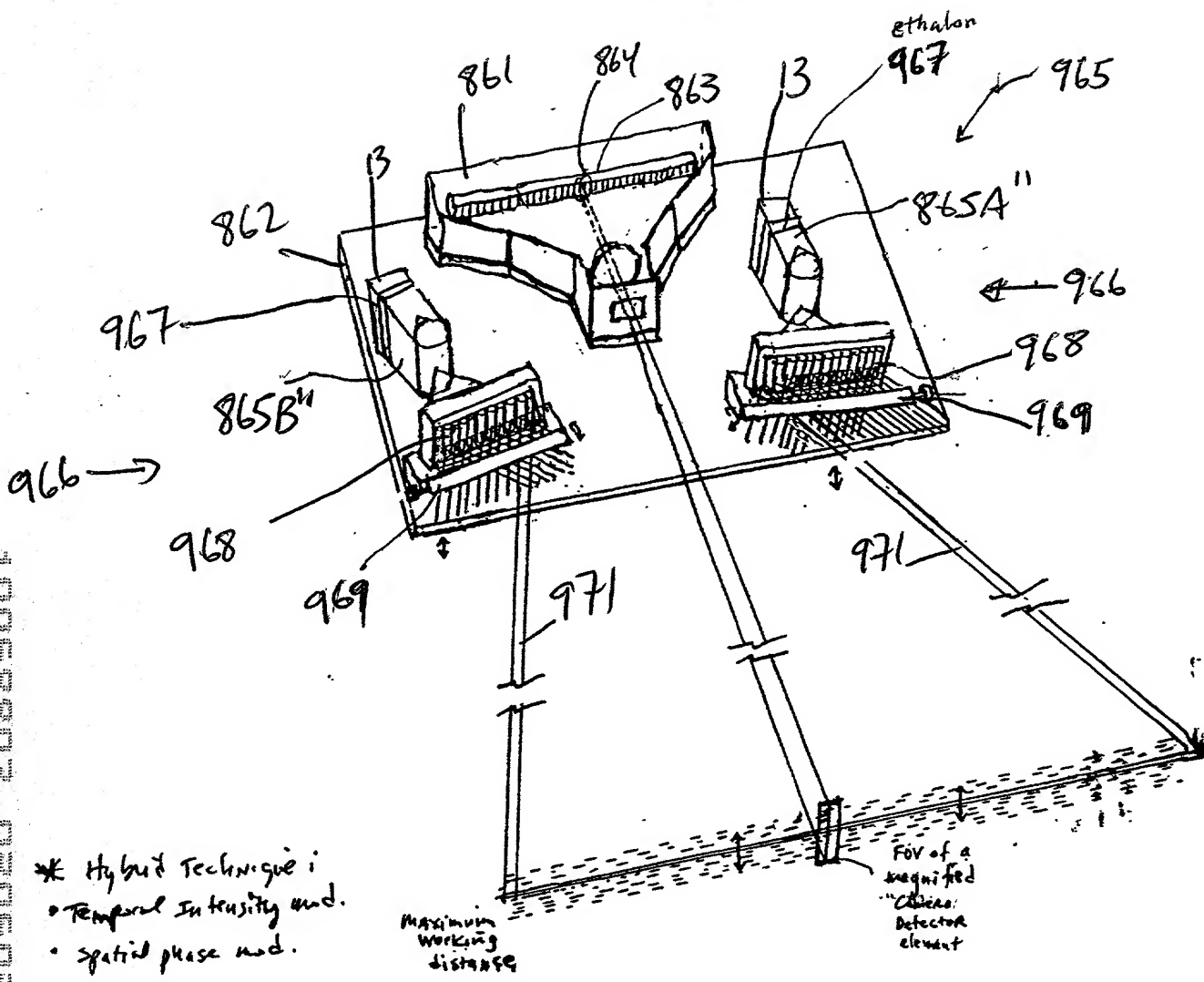


FIG. 1I25K1

Transverse
Microillumination of PLIB

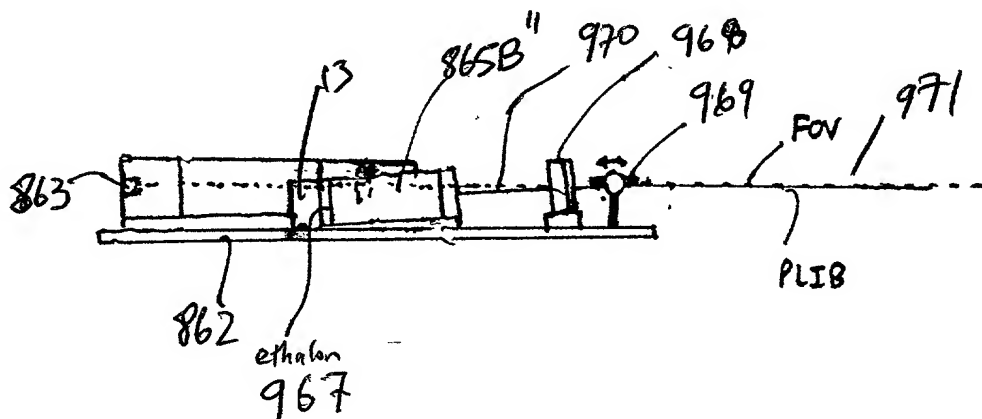
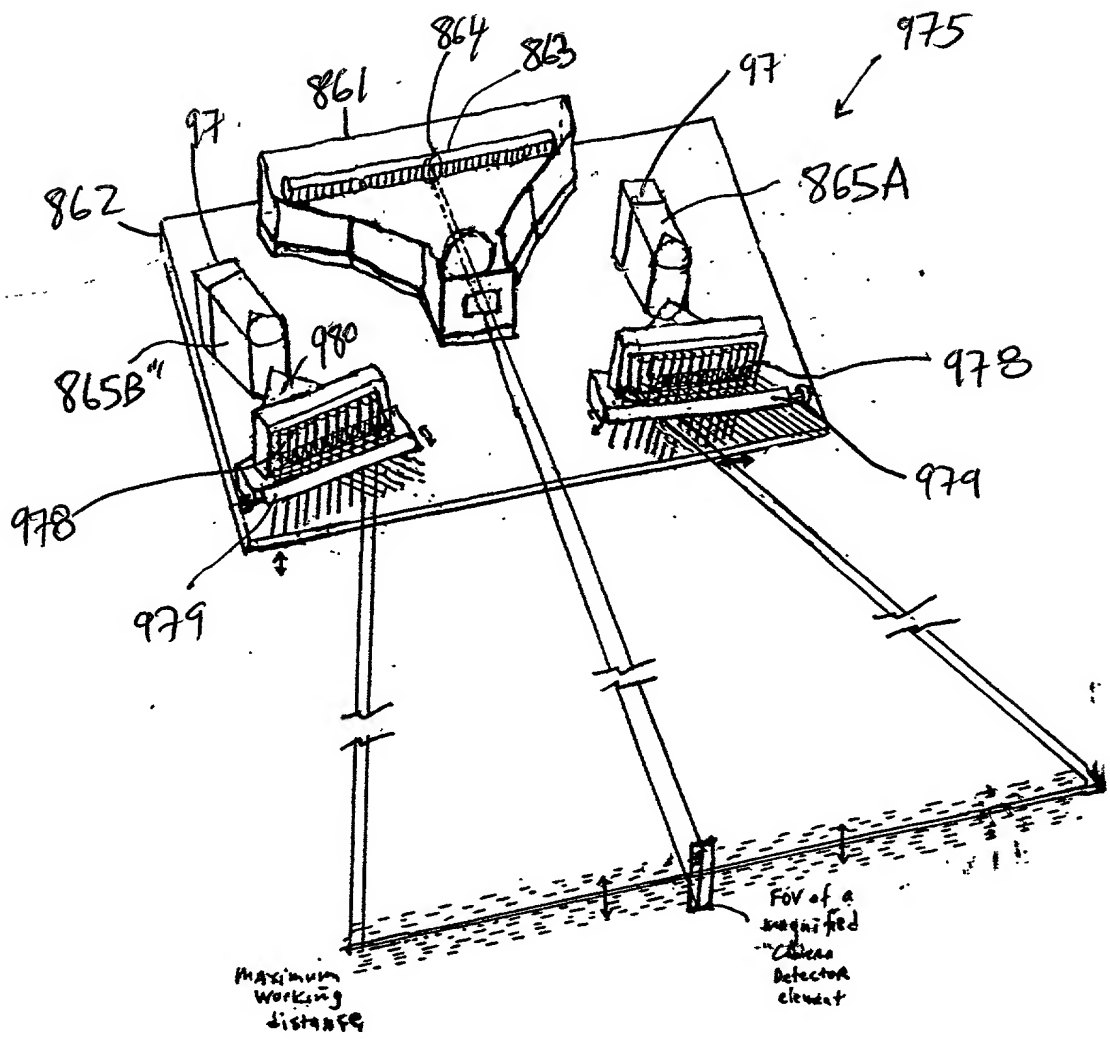


FIG. 1I25K2



* hybrid =
 • Temp. freq. mod.
 • spatial phase mod.
 * Transverse
 Microoscillation of PLIB

FIG. 1I25L1

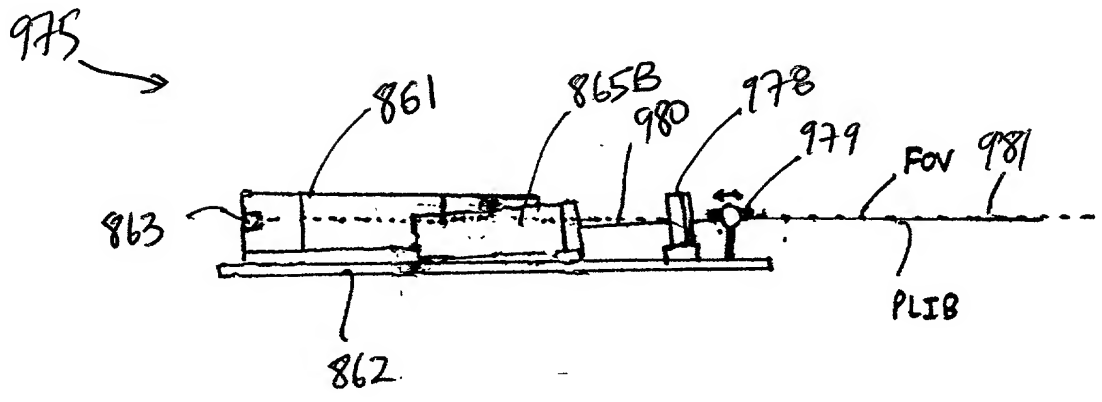
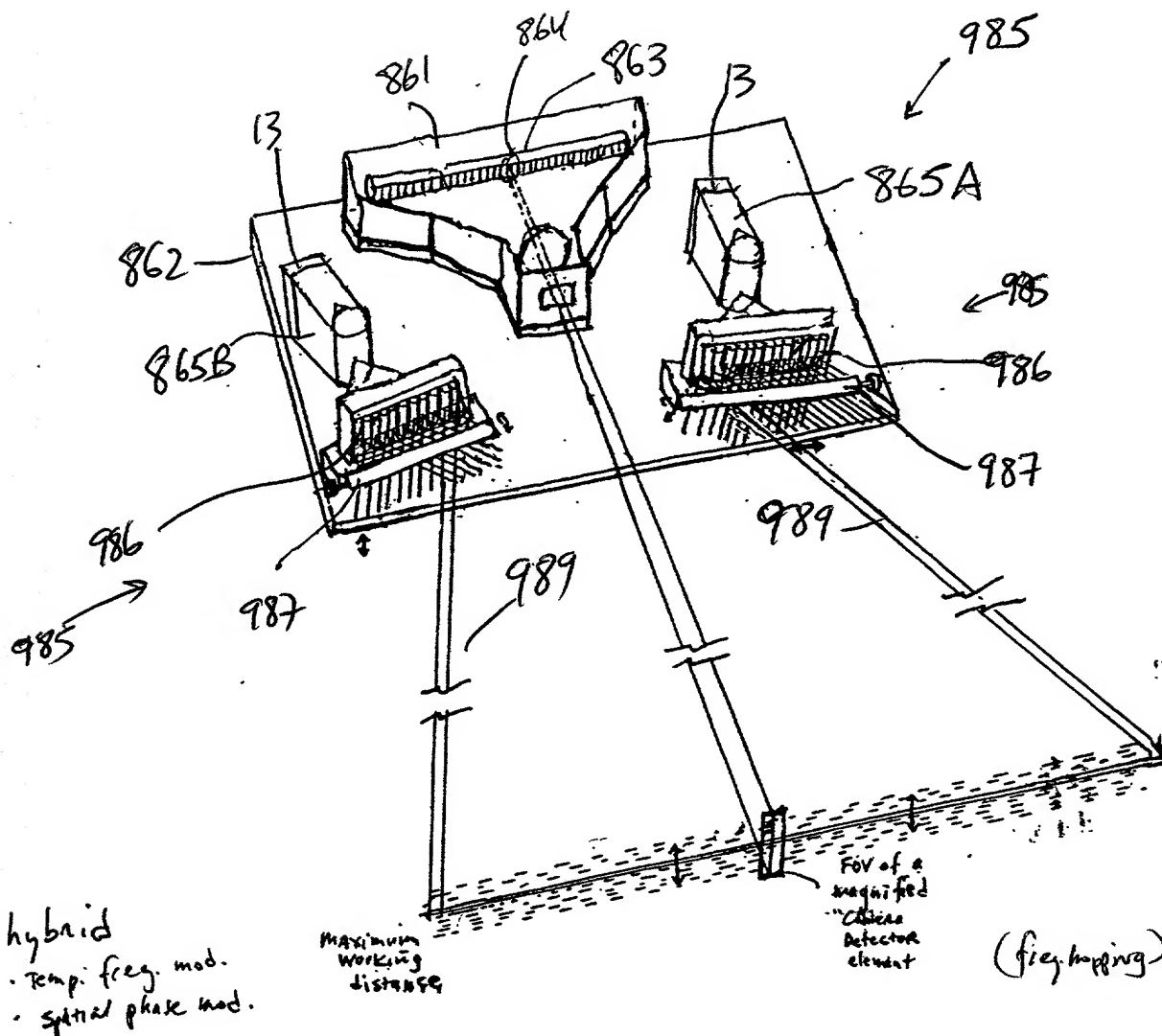


FIG. 1I25L2

10068803.020602

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* Transverse
Microoscillation of PLIB

FIG. 1I25M1

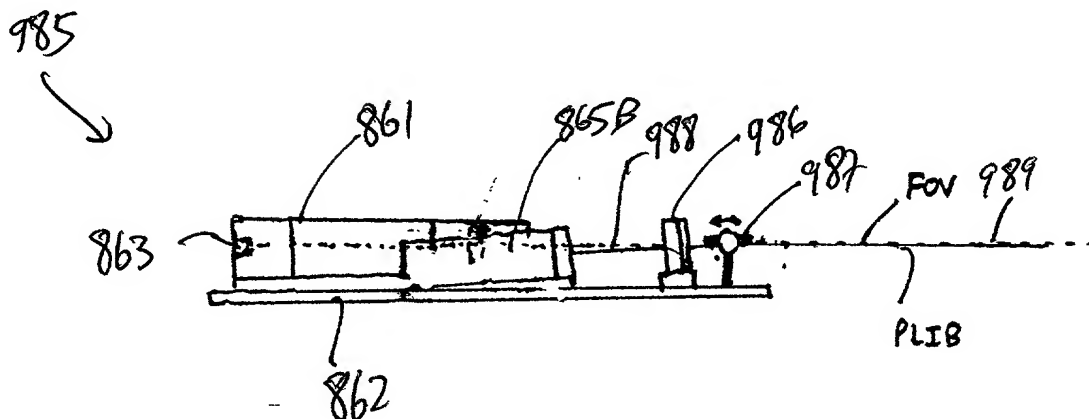
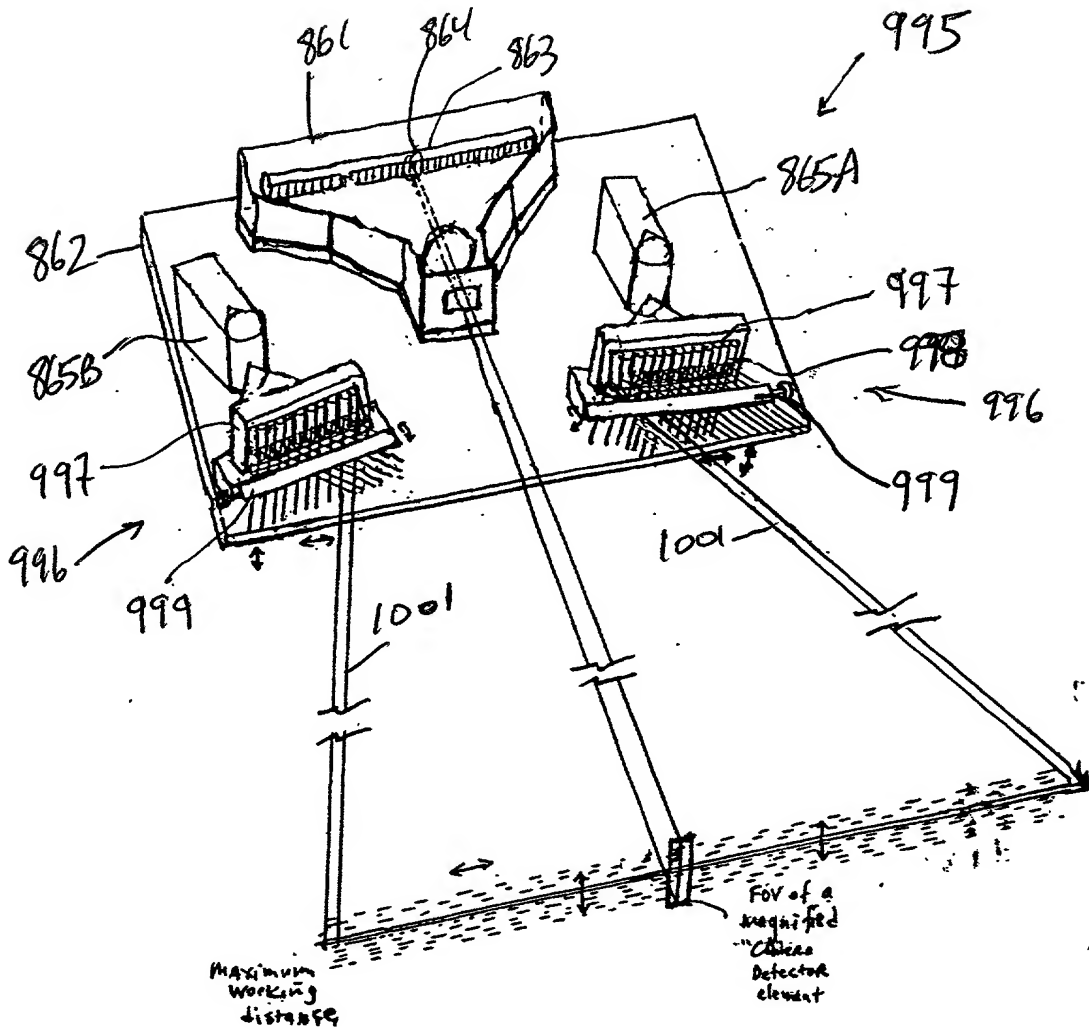


FIG. 1I25M2

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- * hybrid:
 - spatial intensity mod.
 - spatial phase

* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25N1

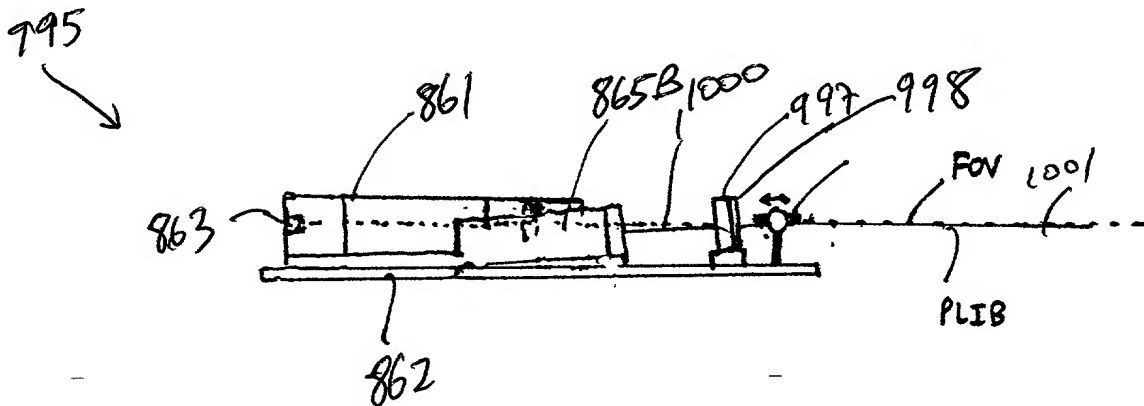


FIG. 1I25NZ

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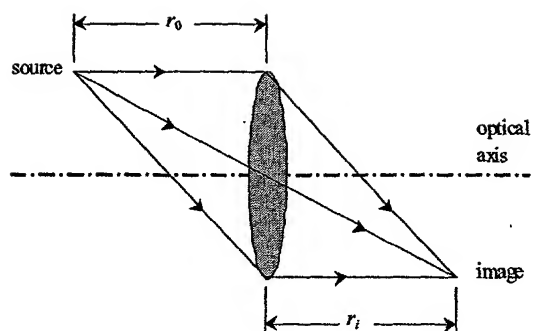


FIG. 1H1

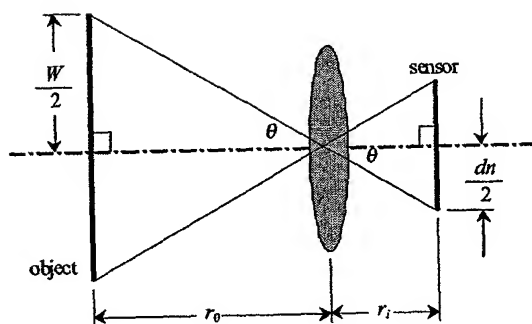


FIG. 1H2

10066603-020602

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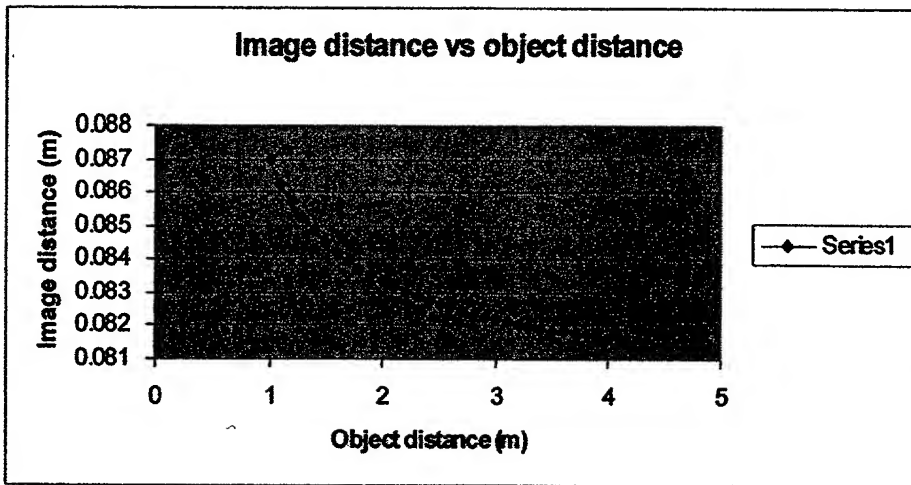


FIG. 1H3

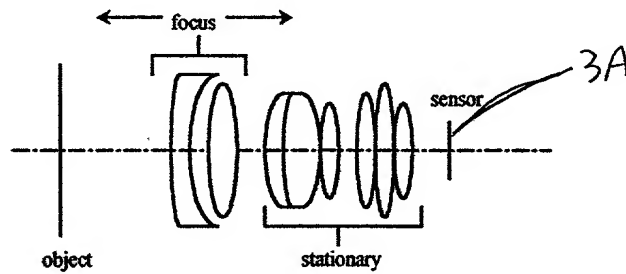


FIG. 1H4

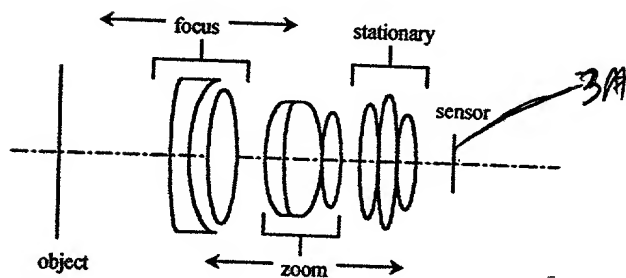


FIG. 1H5

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Fixed focal length lens
Cases

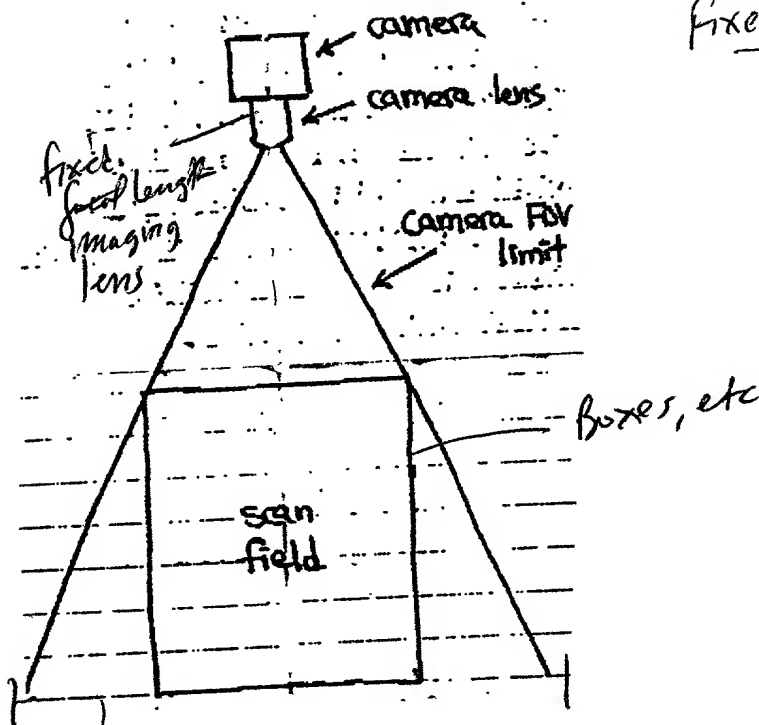
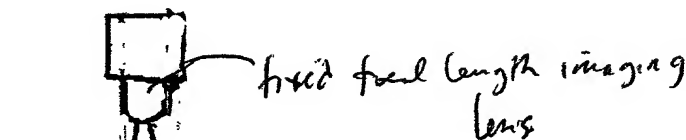


FIG. 1K1

conveyor 34



conveyor
34

FIG. 1K2

2099007 E0899007 10068003 020602

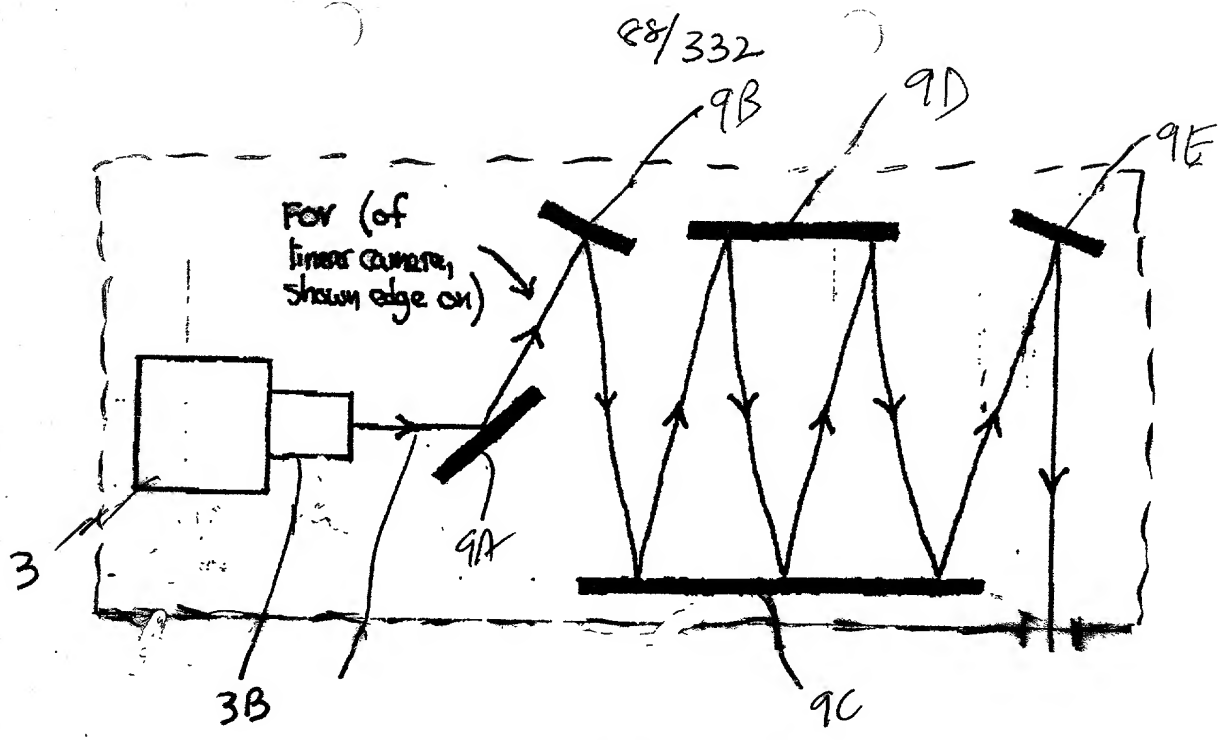


FIG. 1L1

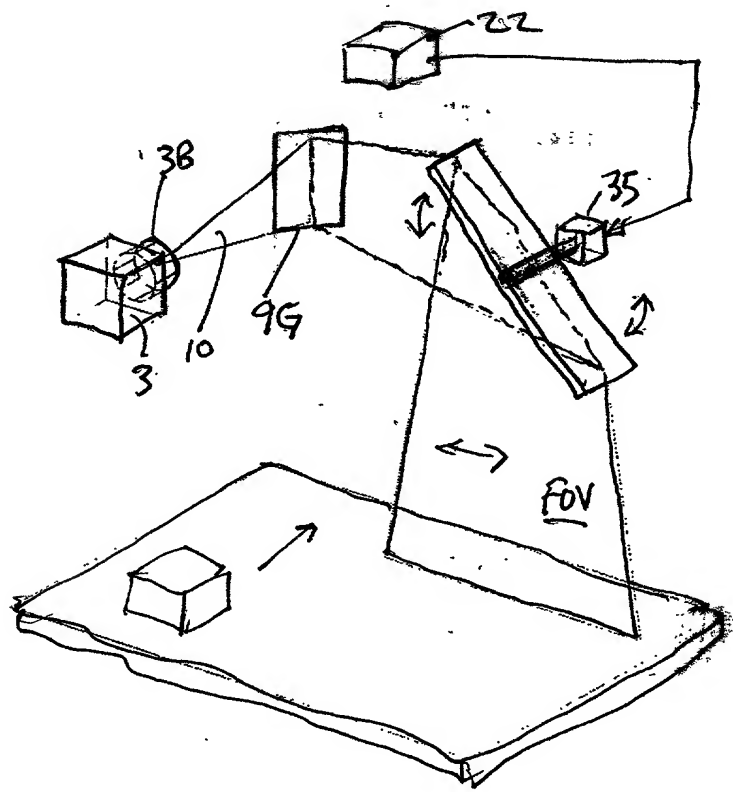


FIG. 1L2

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Pixel power density vs. object distance (general example)

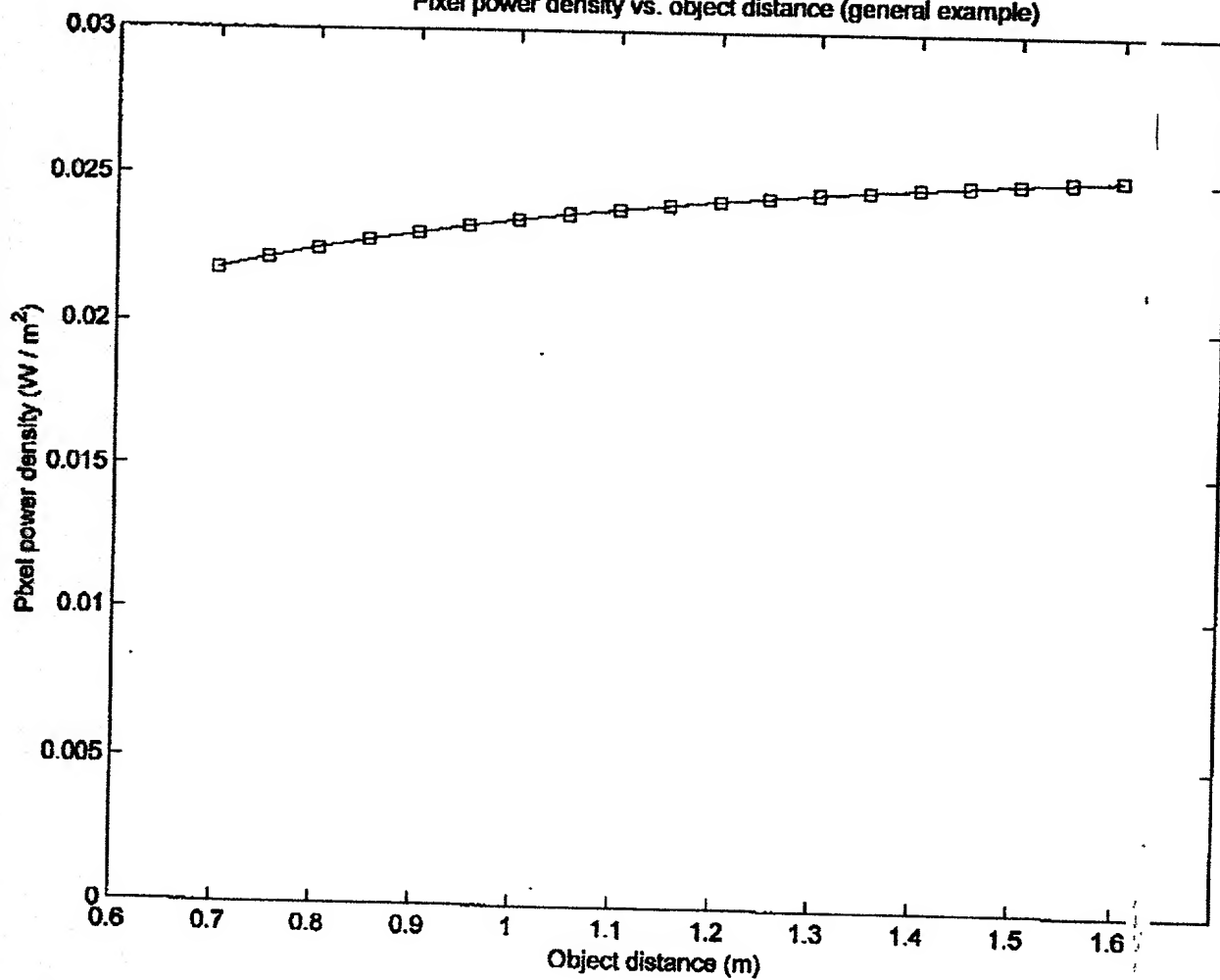


FIG-1M1

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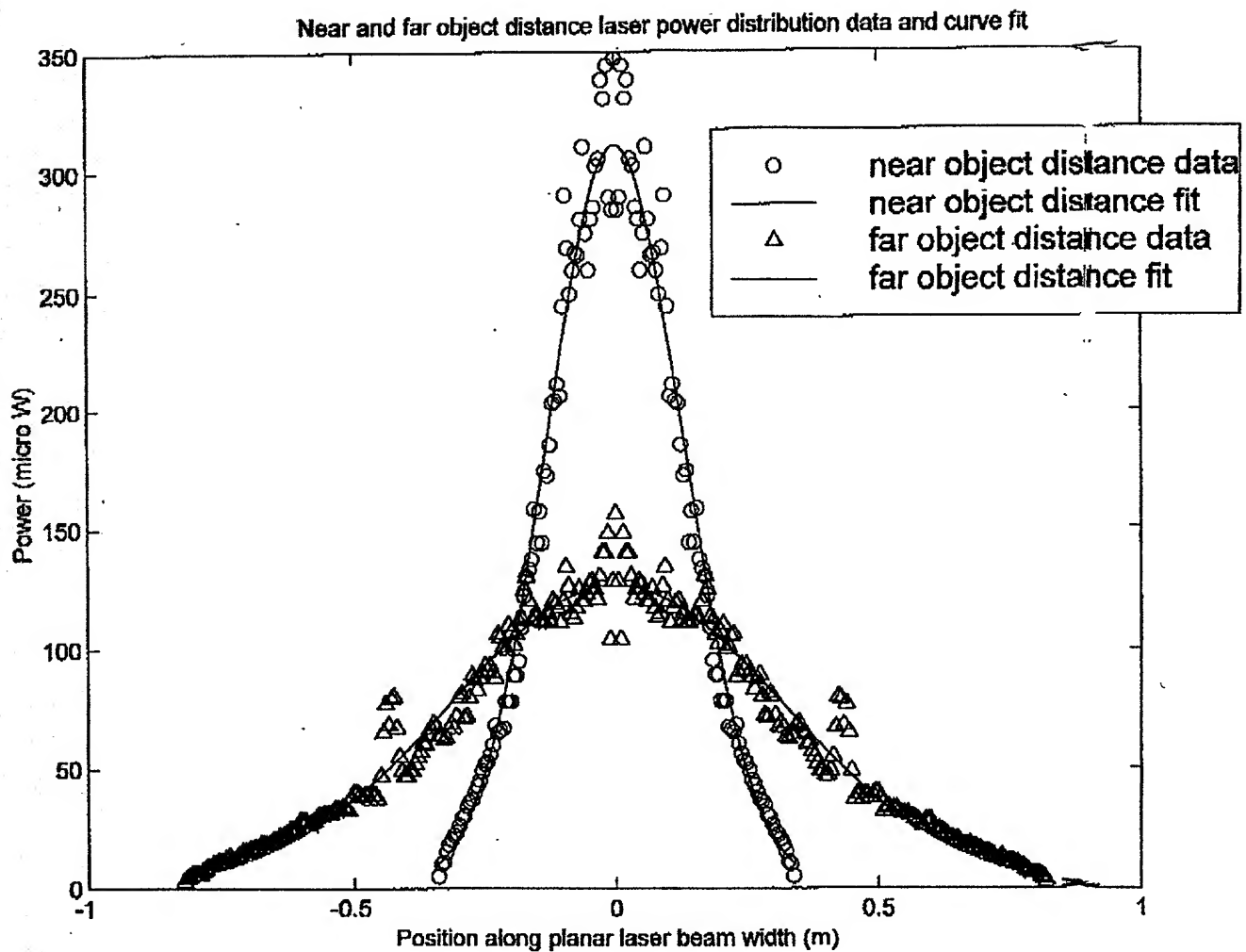


FIG. 1M2

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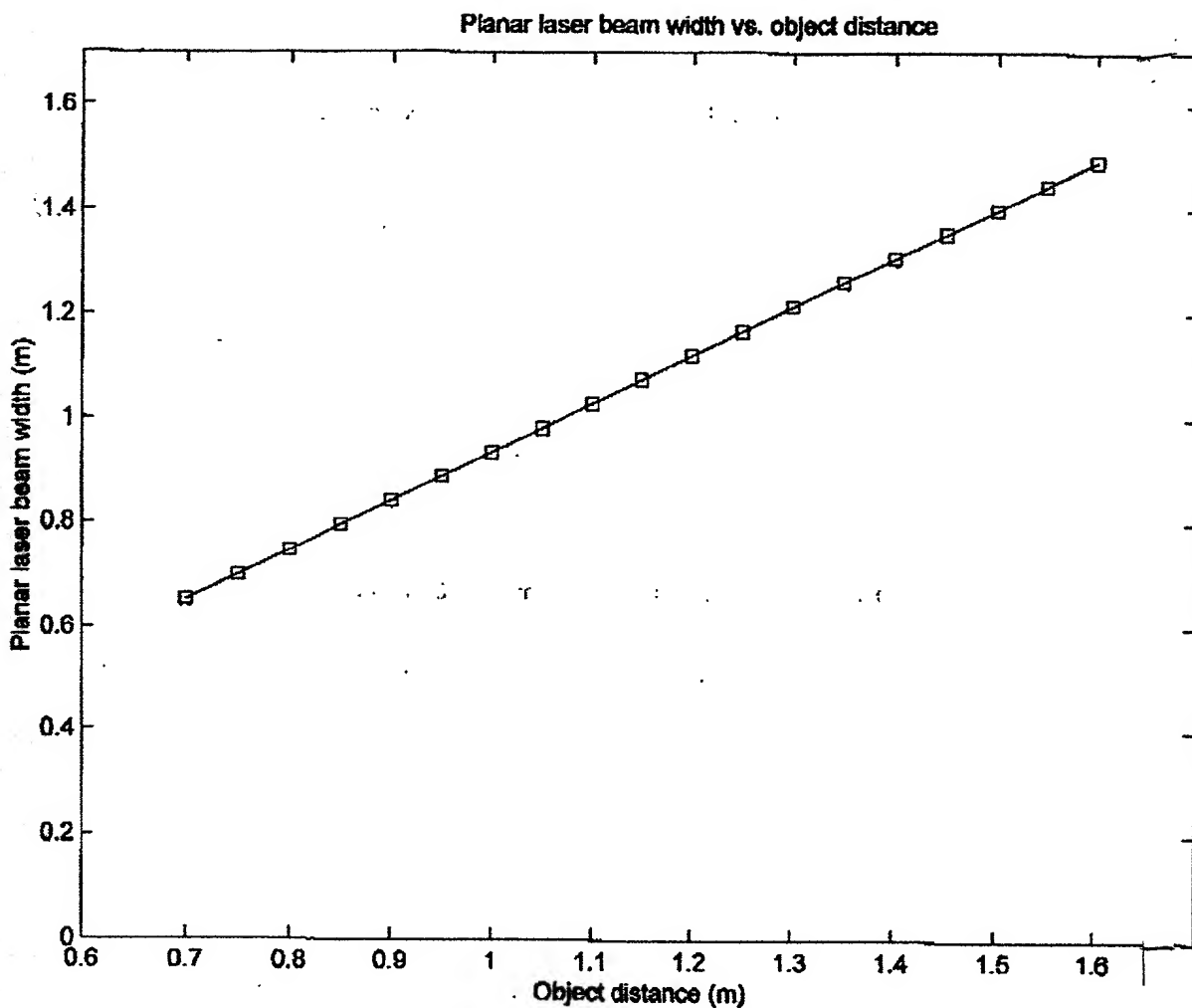


FIG. 1M3

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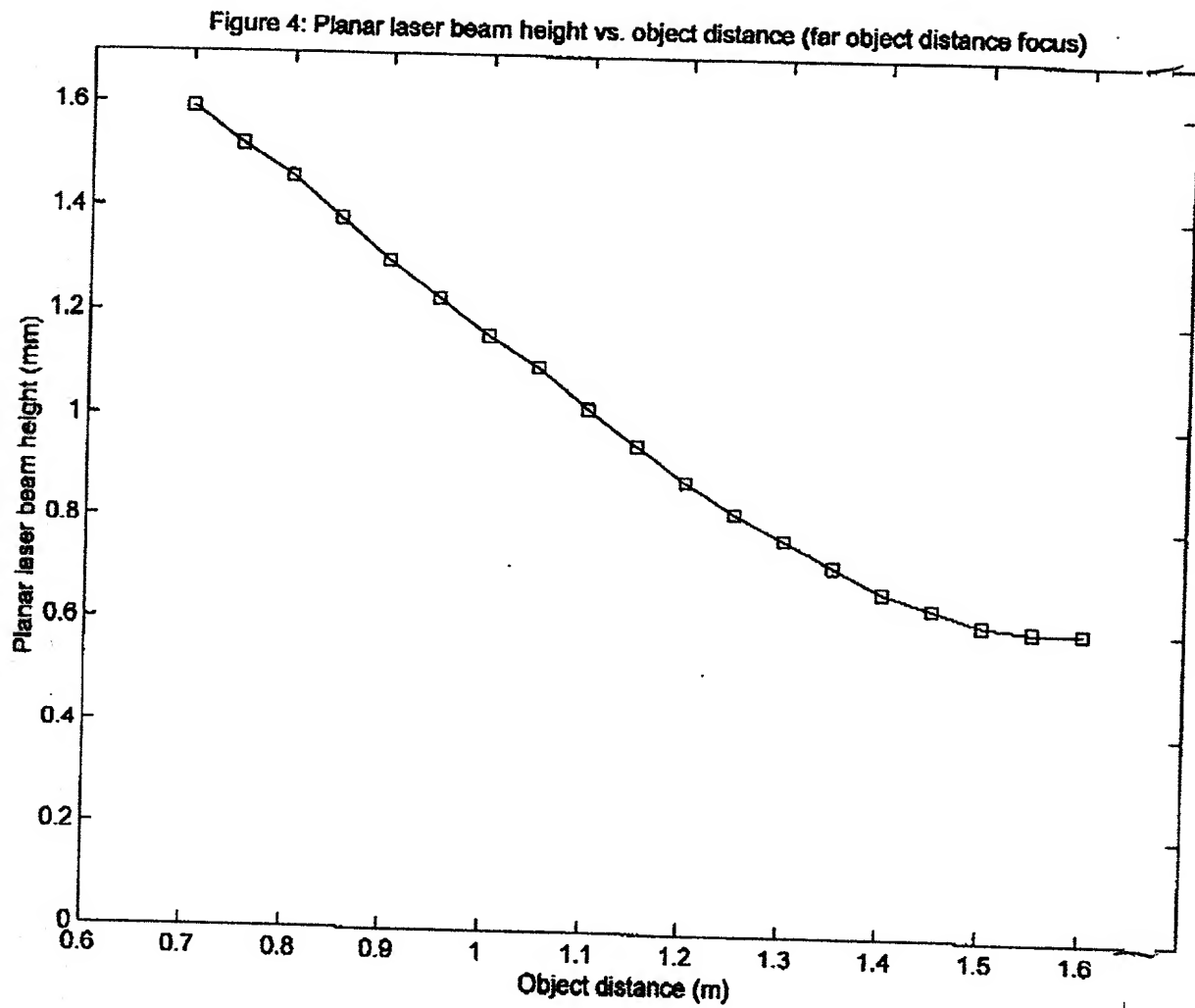


FIG. 1M4

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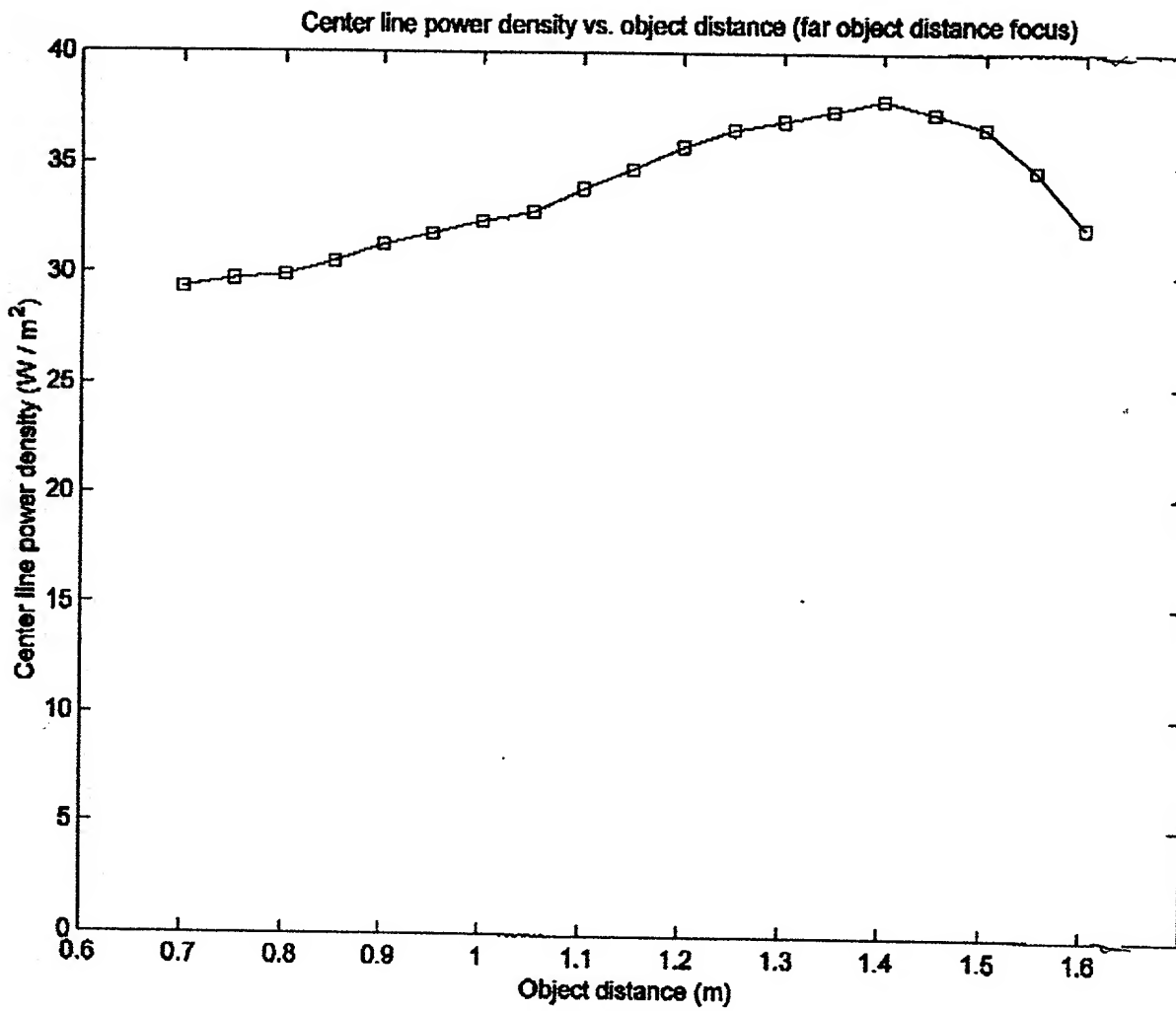


FIG.-1N

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Figure 6: Pixel power densities vs. object distance

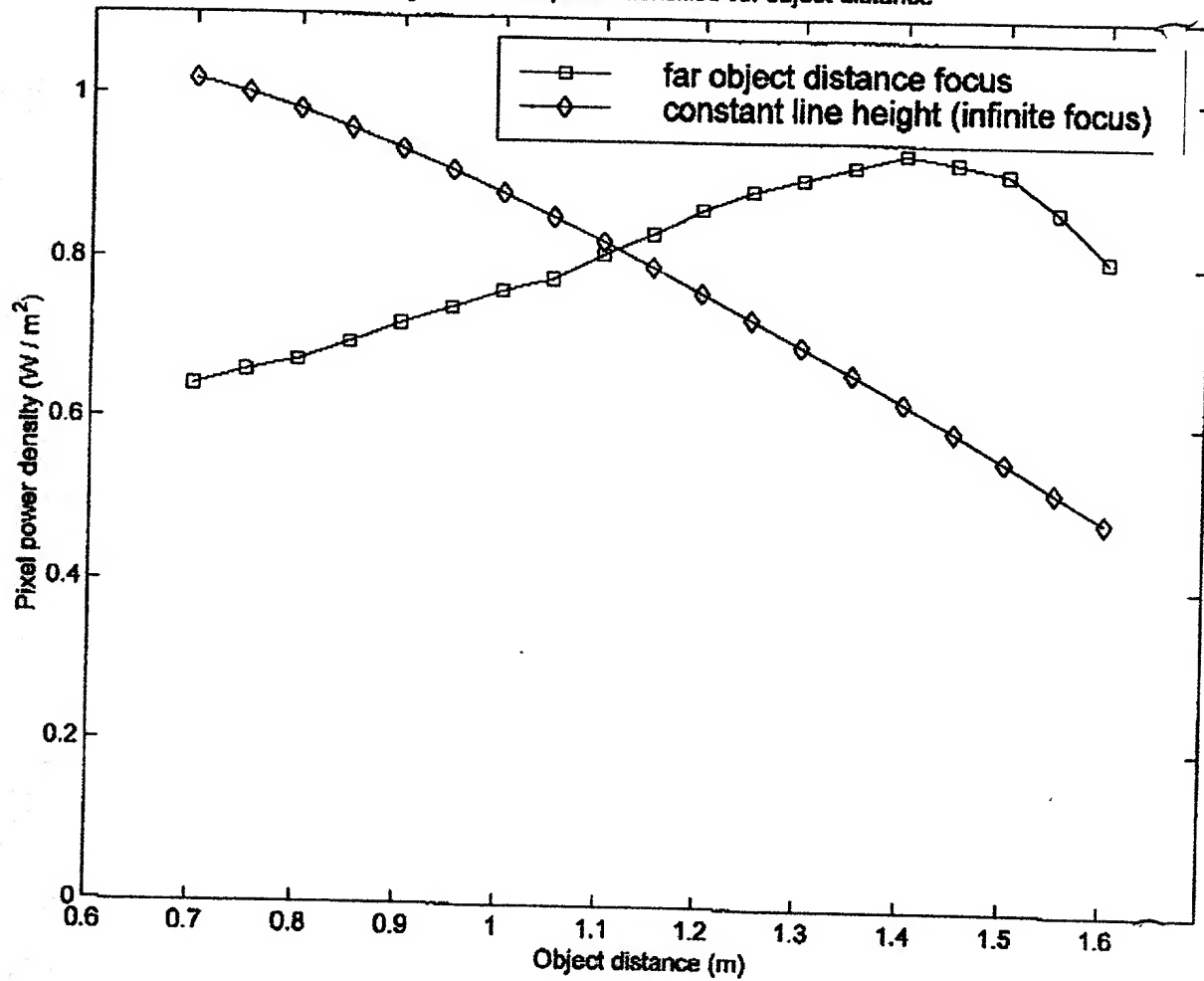


FIG. 10

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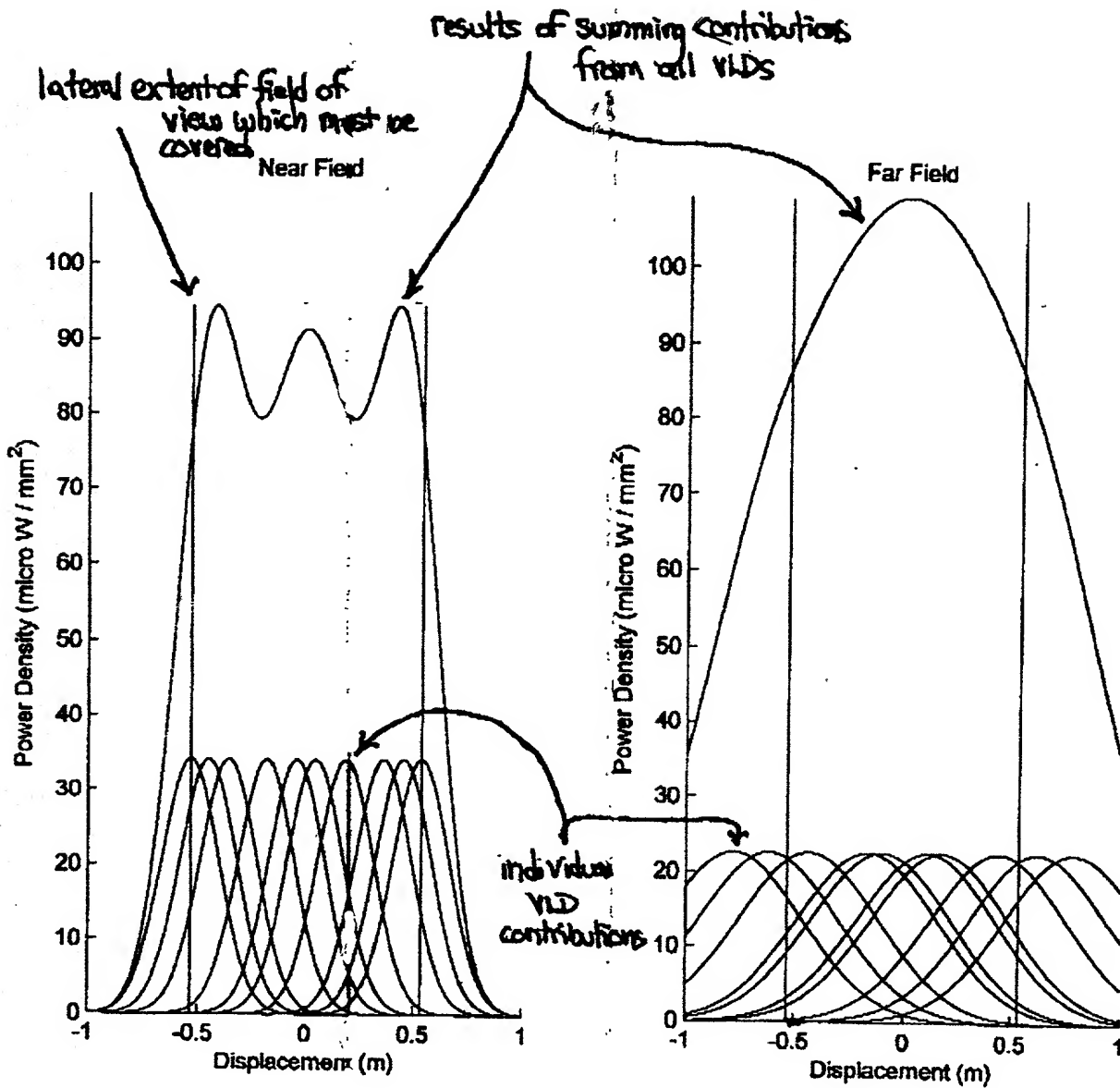


FIG 1P1

FIG 1P2

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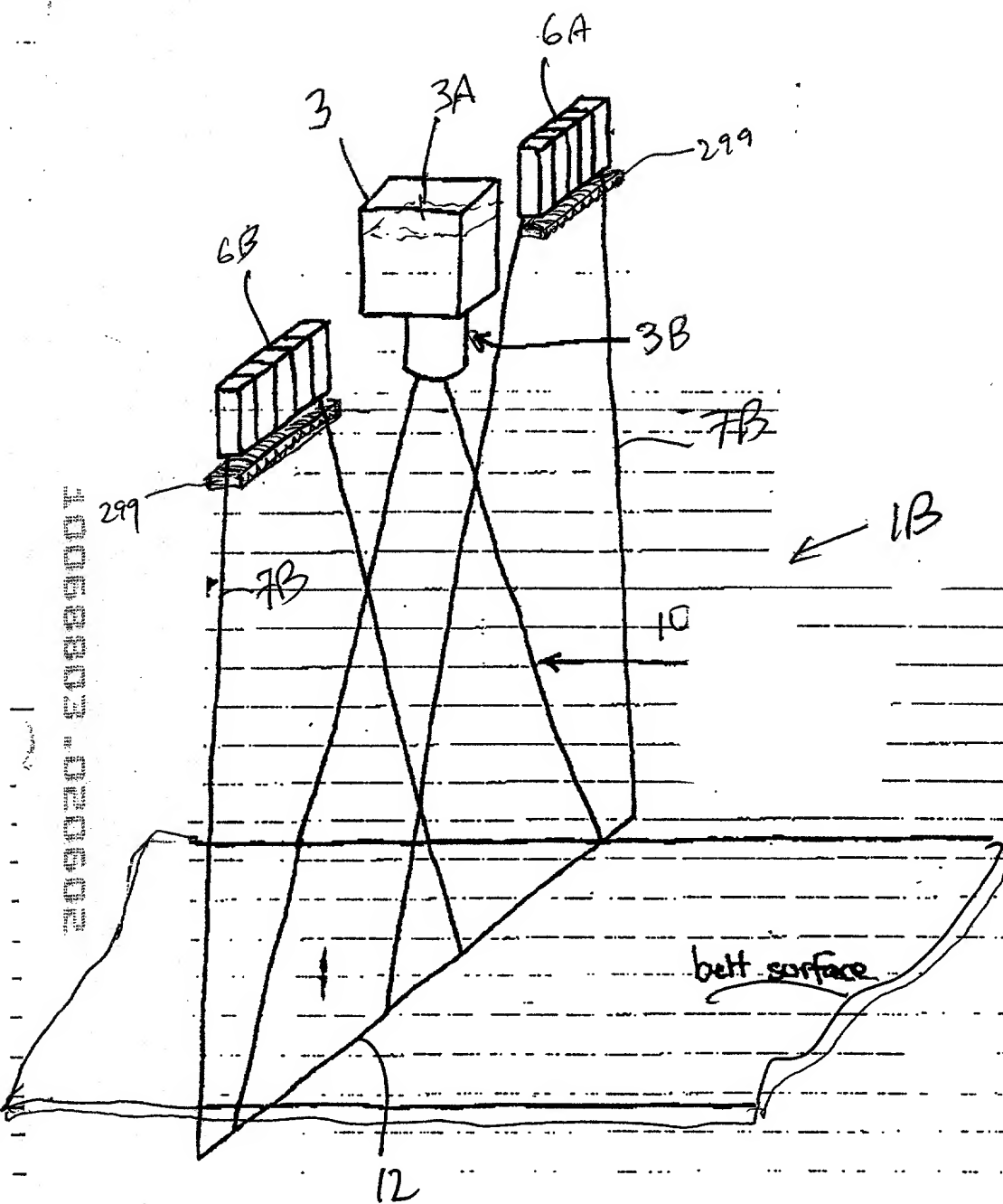
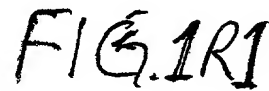


FIG. 1Q1



Fig. 102

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Fixed focal length / fixed focal distance

FIG. 1R2

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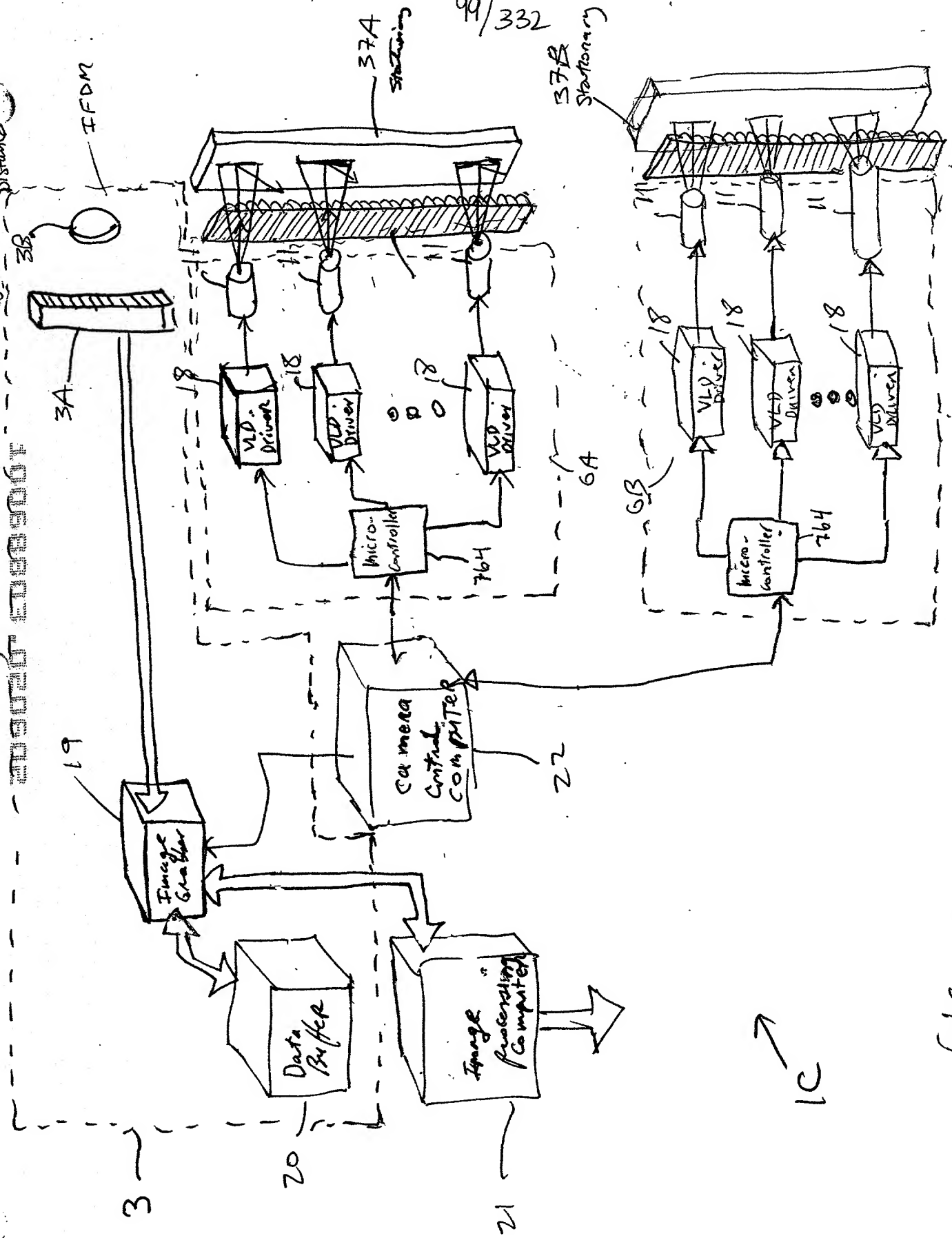


FIG. 1R2

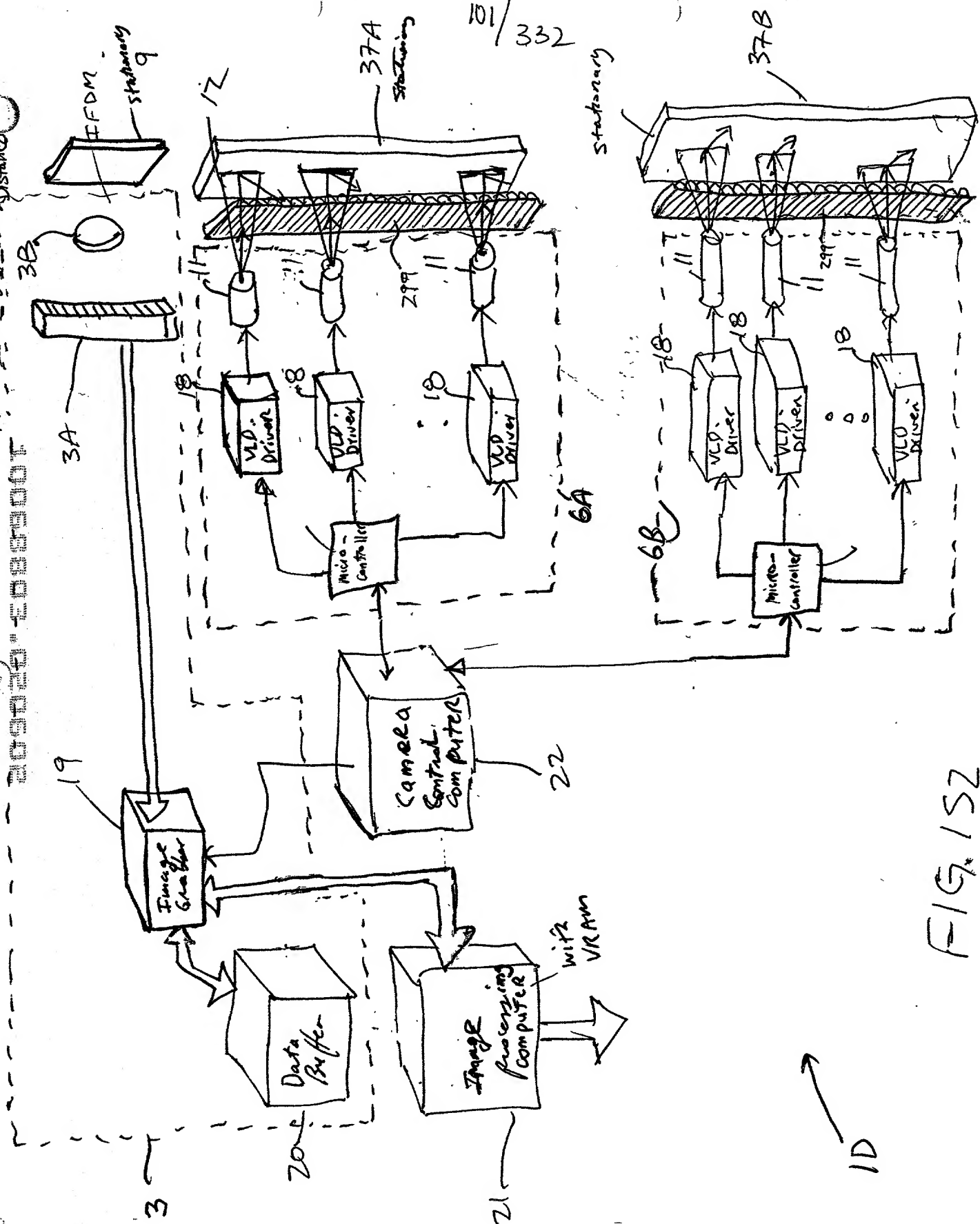


FIG. 152

10068303-000603

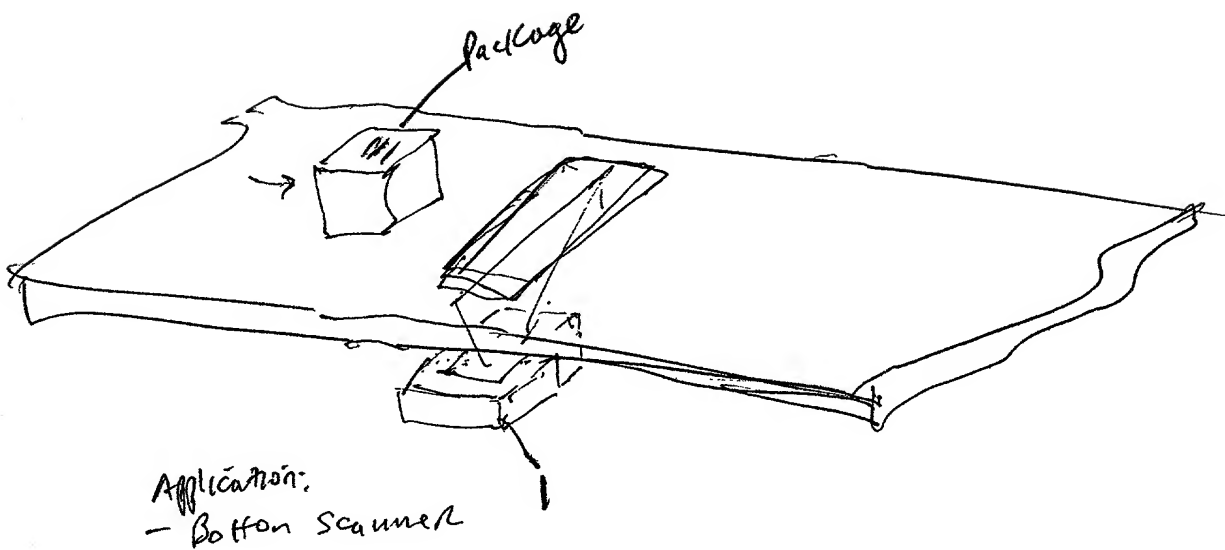
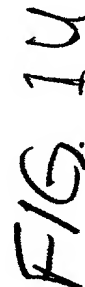


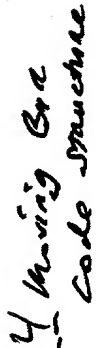
FIG 1T



Applications: 3A

- Hand-held Scanner
- Presentation Scanner

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3-D Scanning
Region

FIG. VI

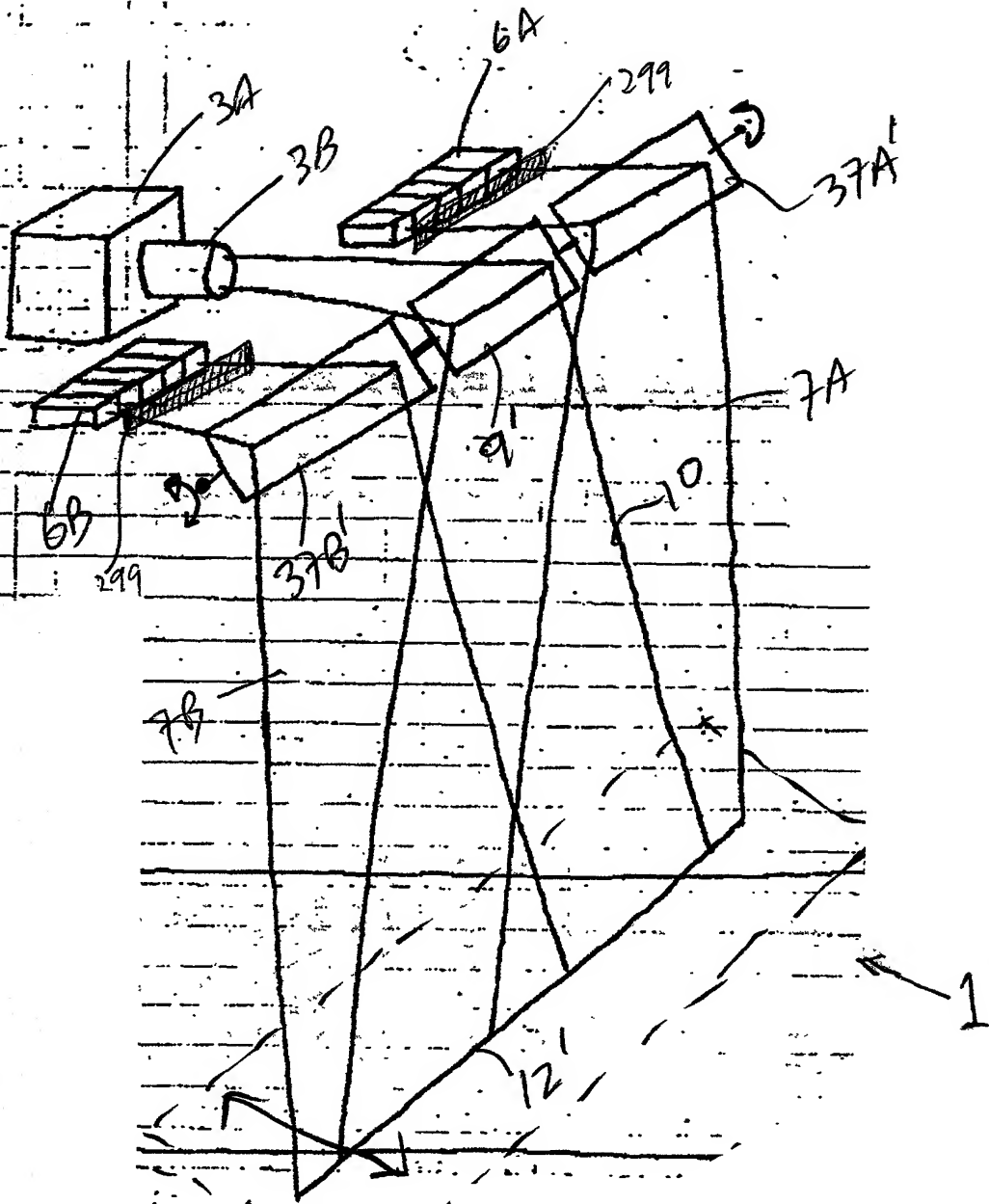


FIG. IV2

2-D
region
of
space

Fixed focal length / fixed focal distance

109830-0089001

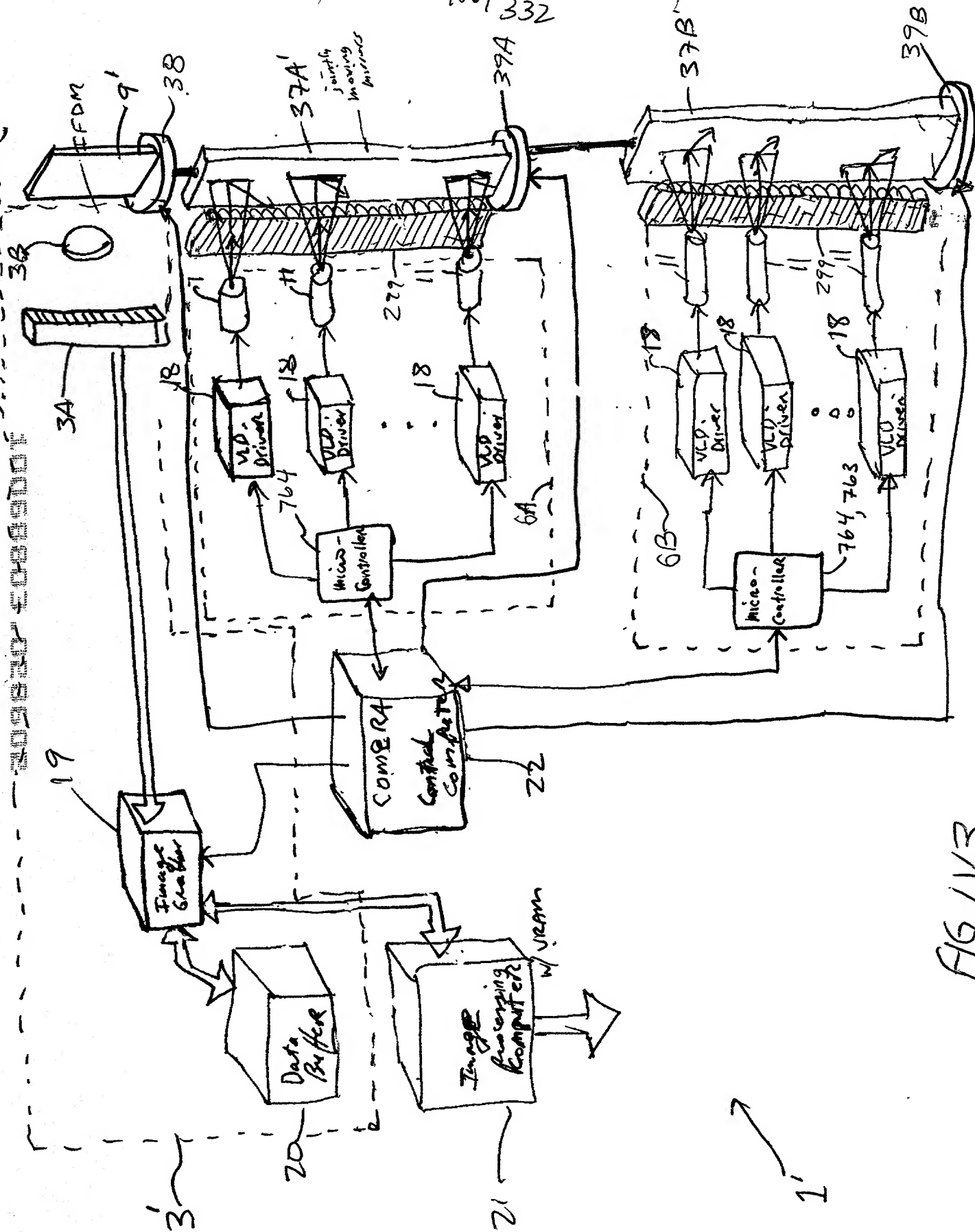


FIG. 1V3

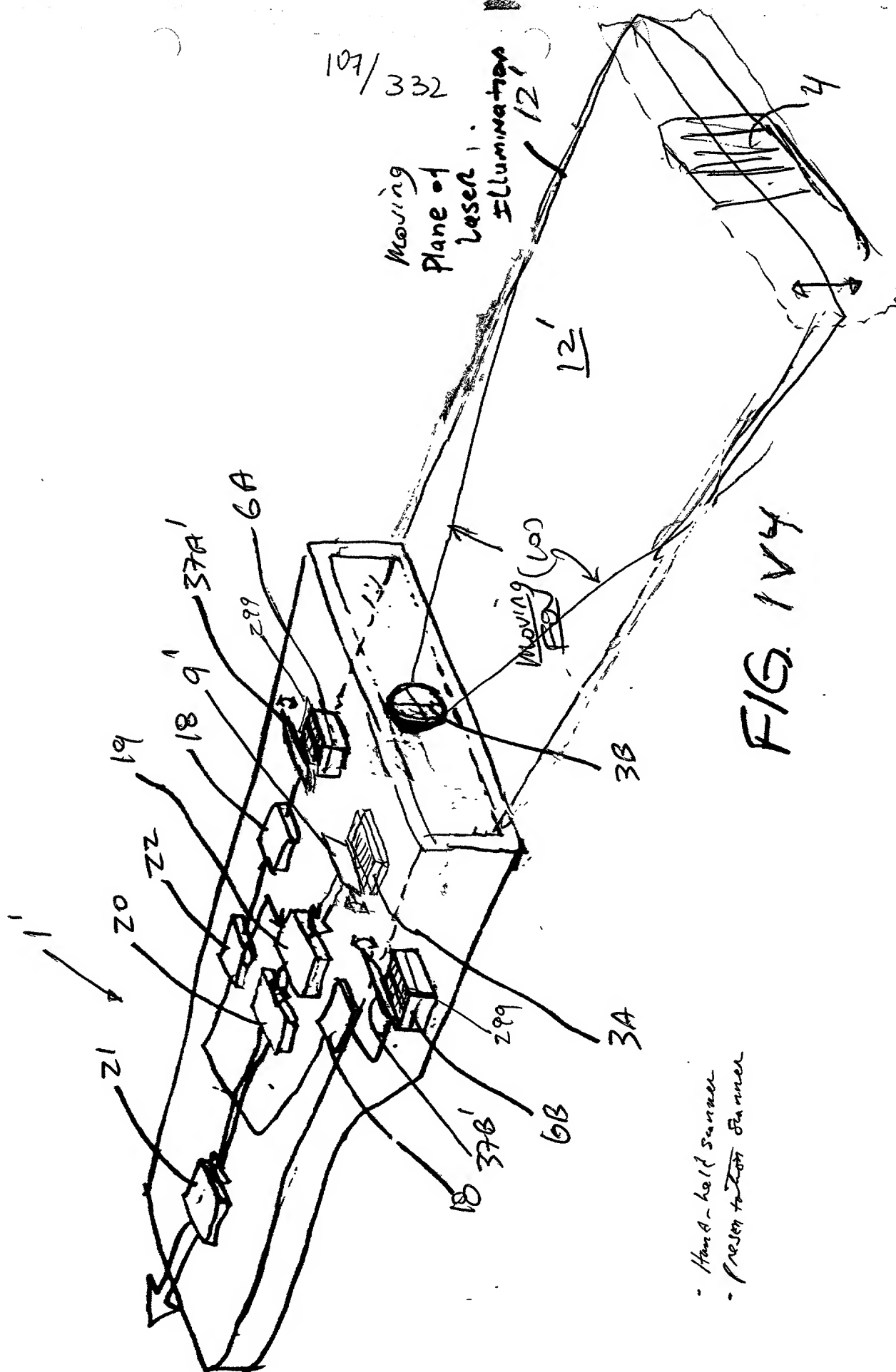


FIG. 1A

2009020-20889001

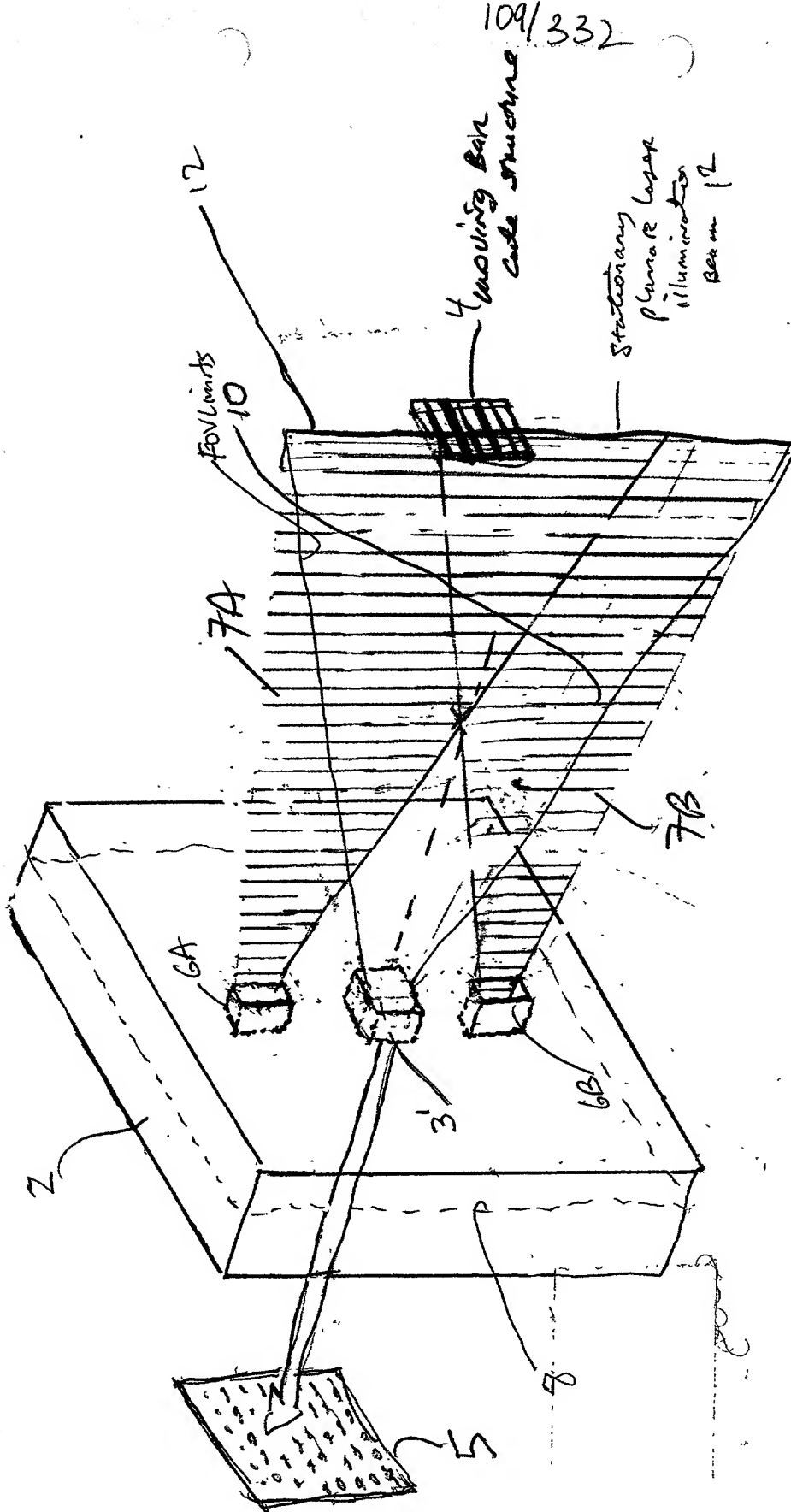


FIG. 2A

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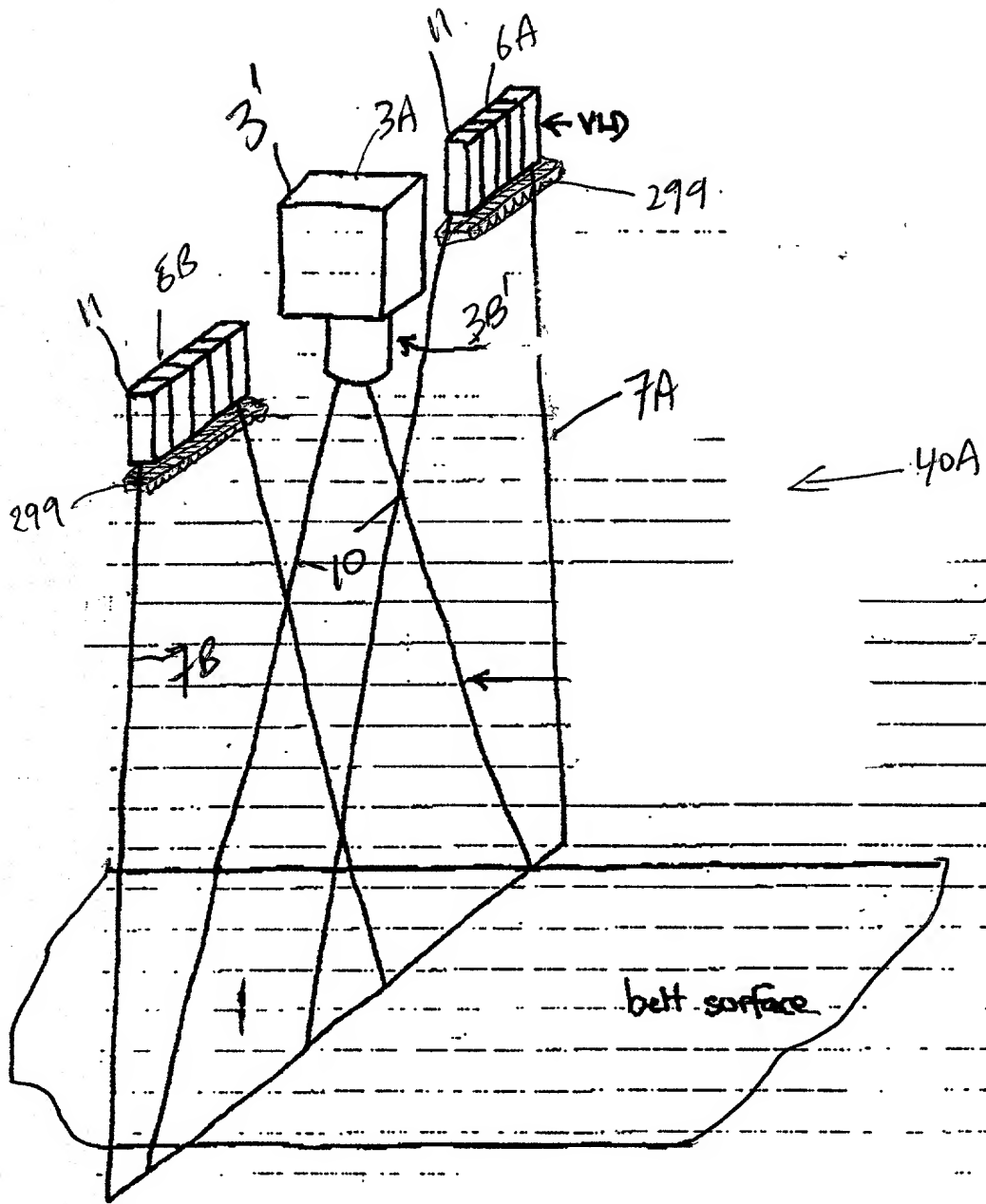


FIG. 2 B1

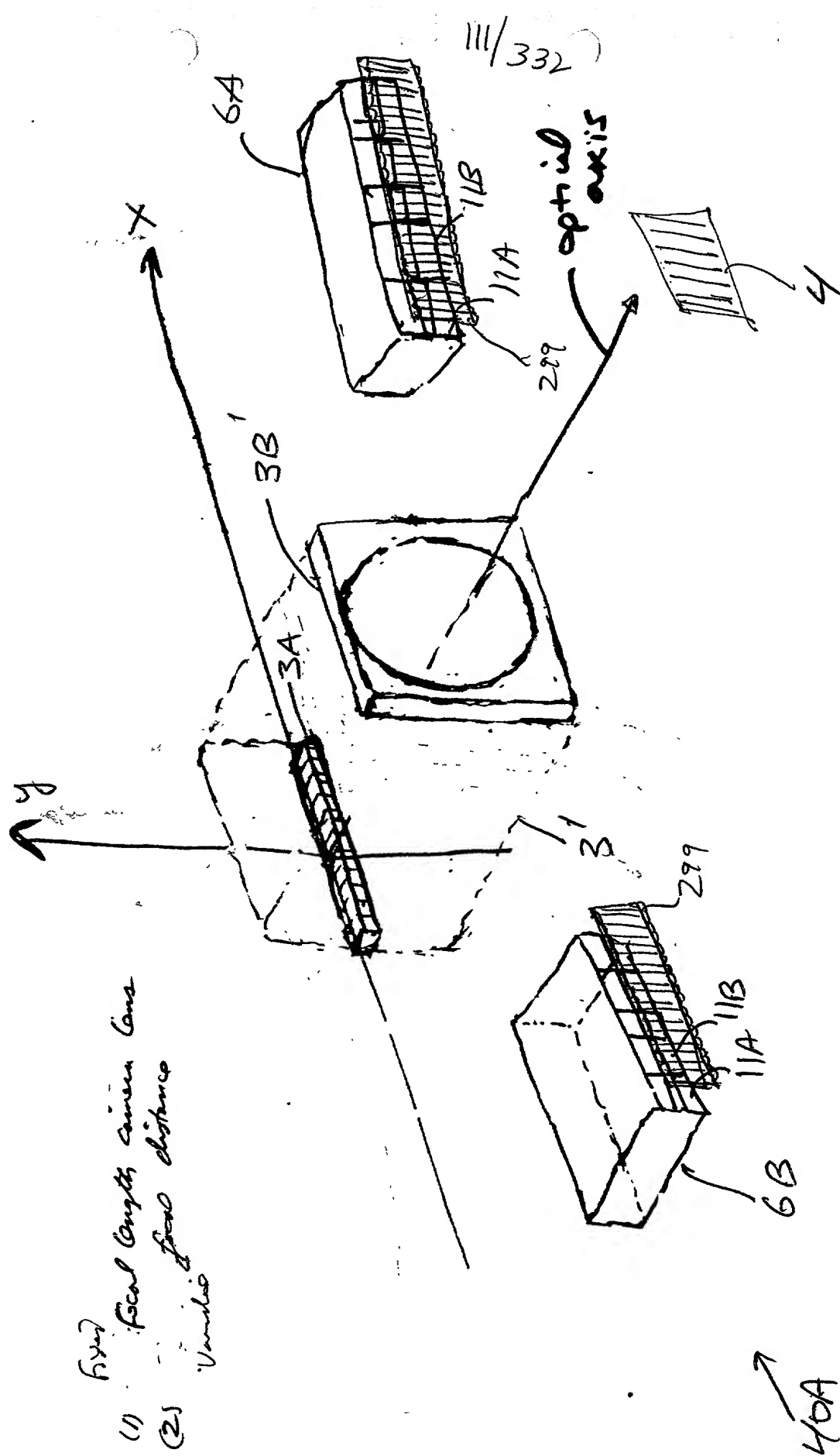


FIG. 2B2

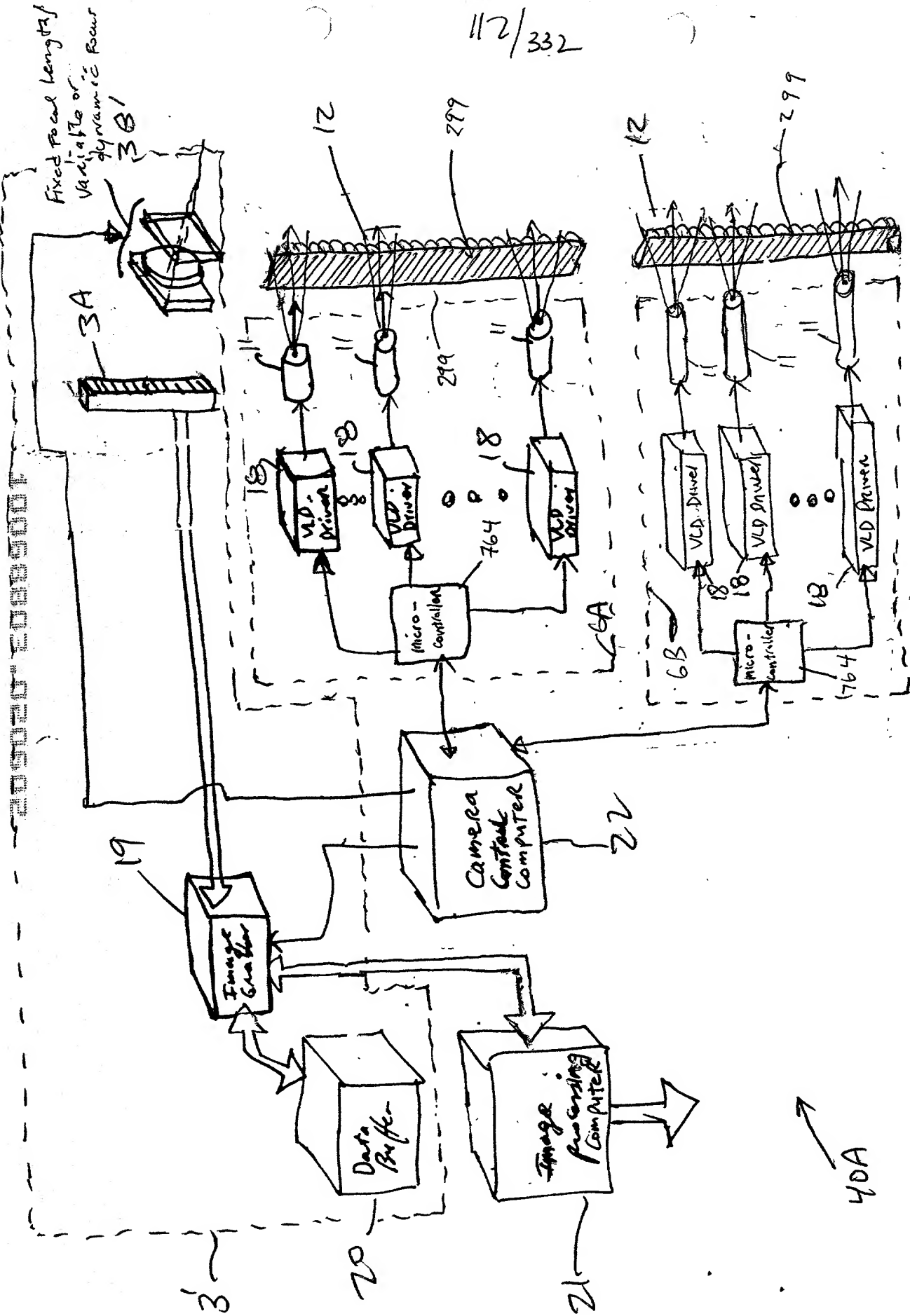


FIG. 2C1

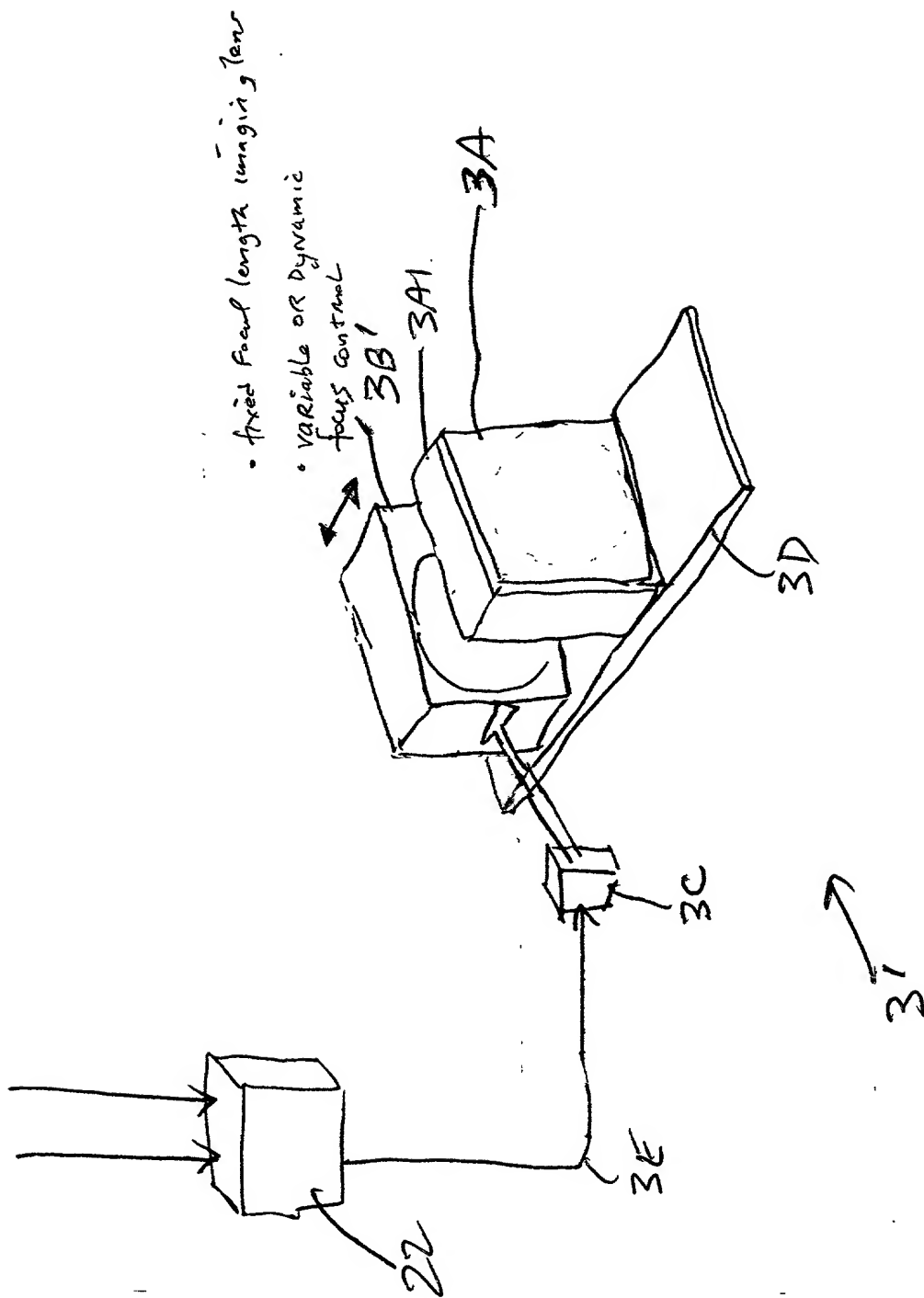


FIG. 2C2

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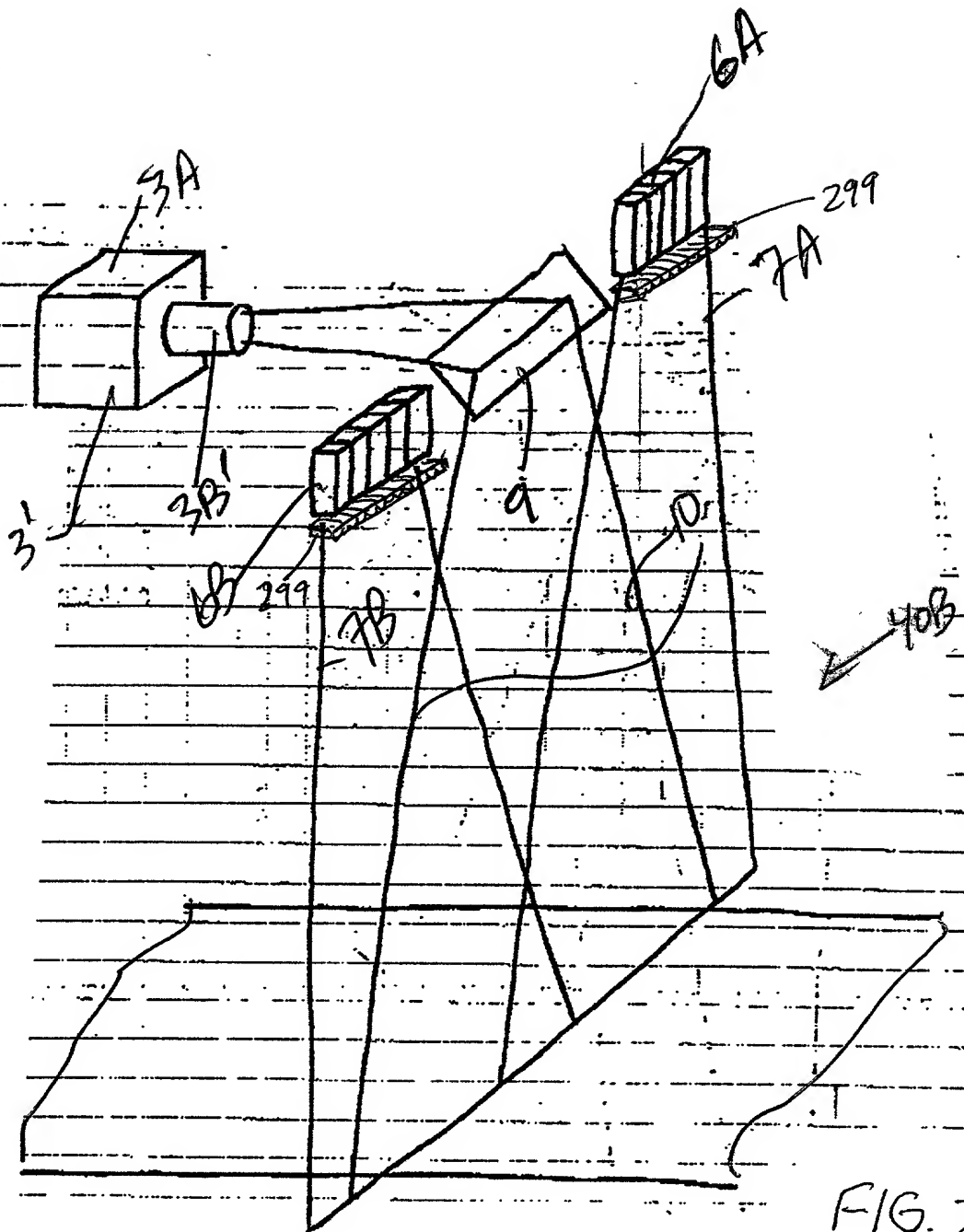


FIG. 2D1



FIG. 2D2

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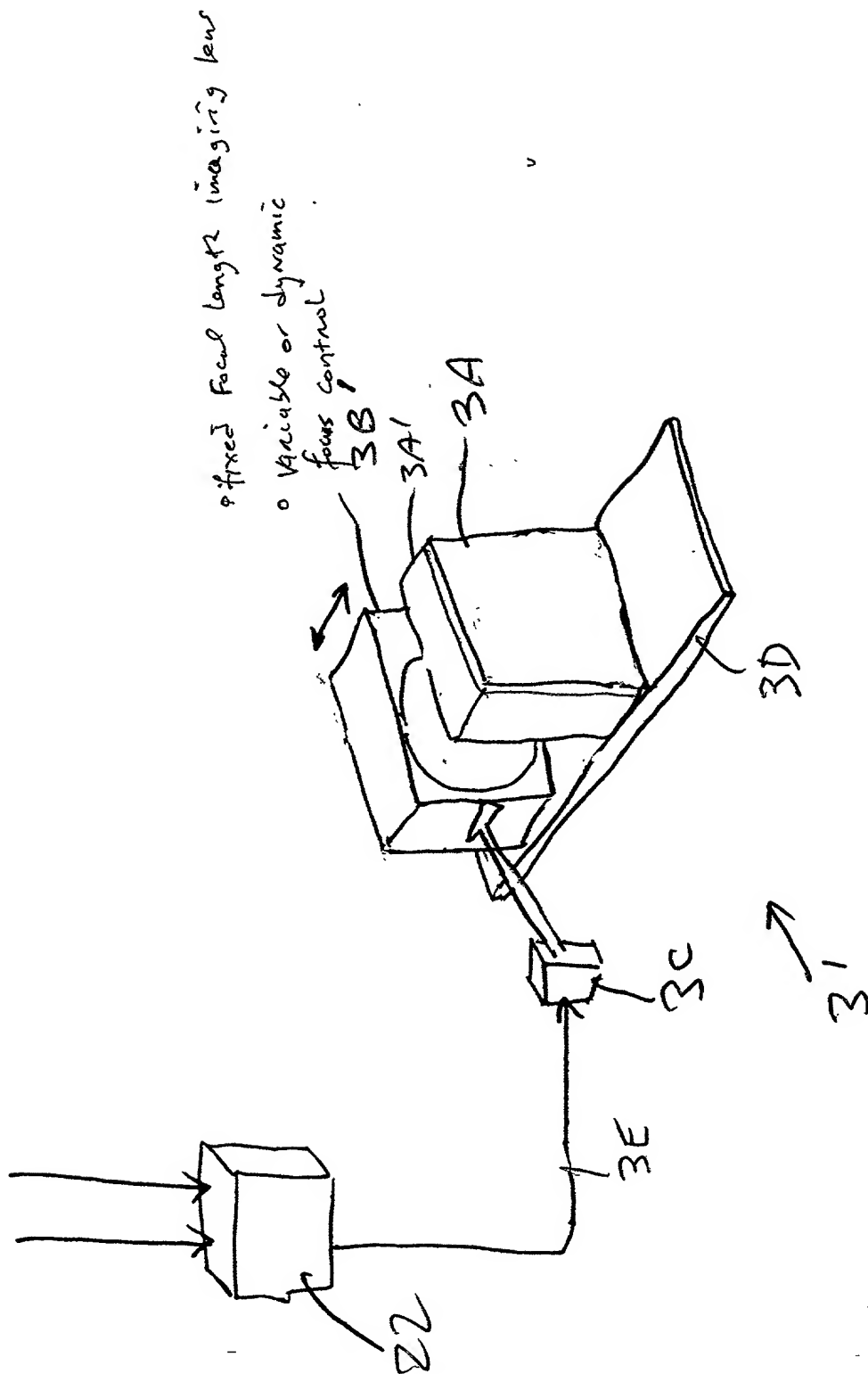
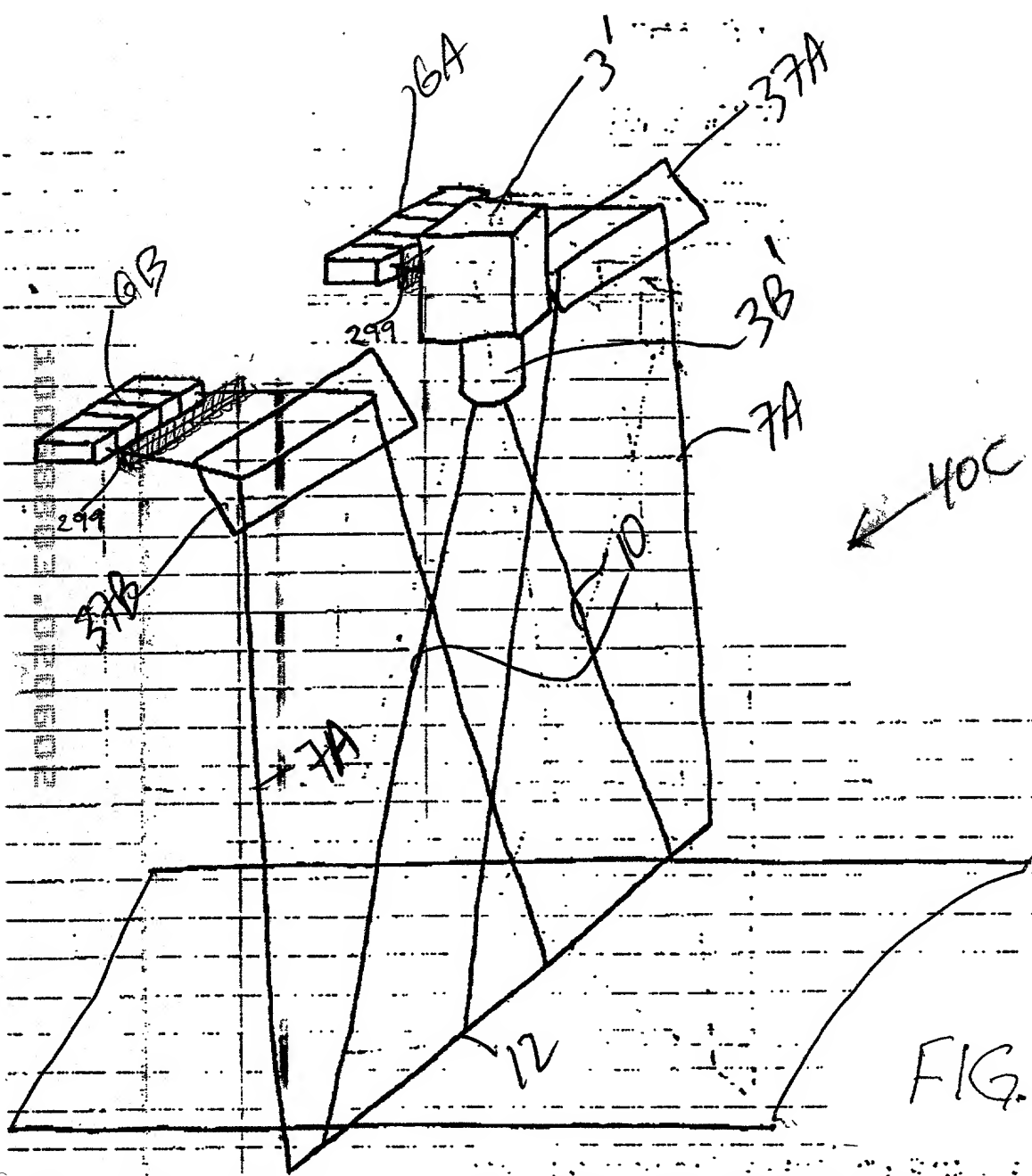


FIG. 2D3

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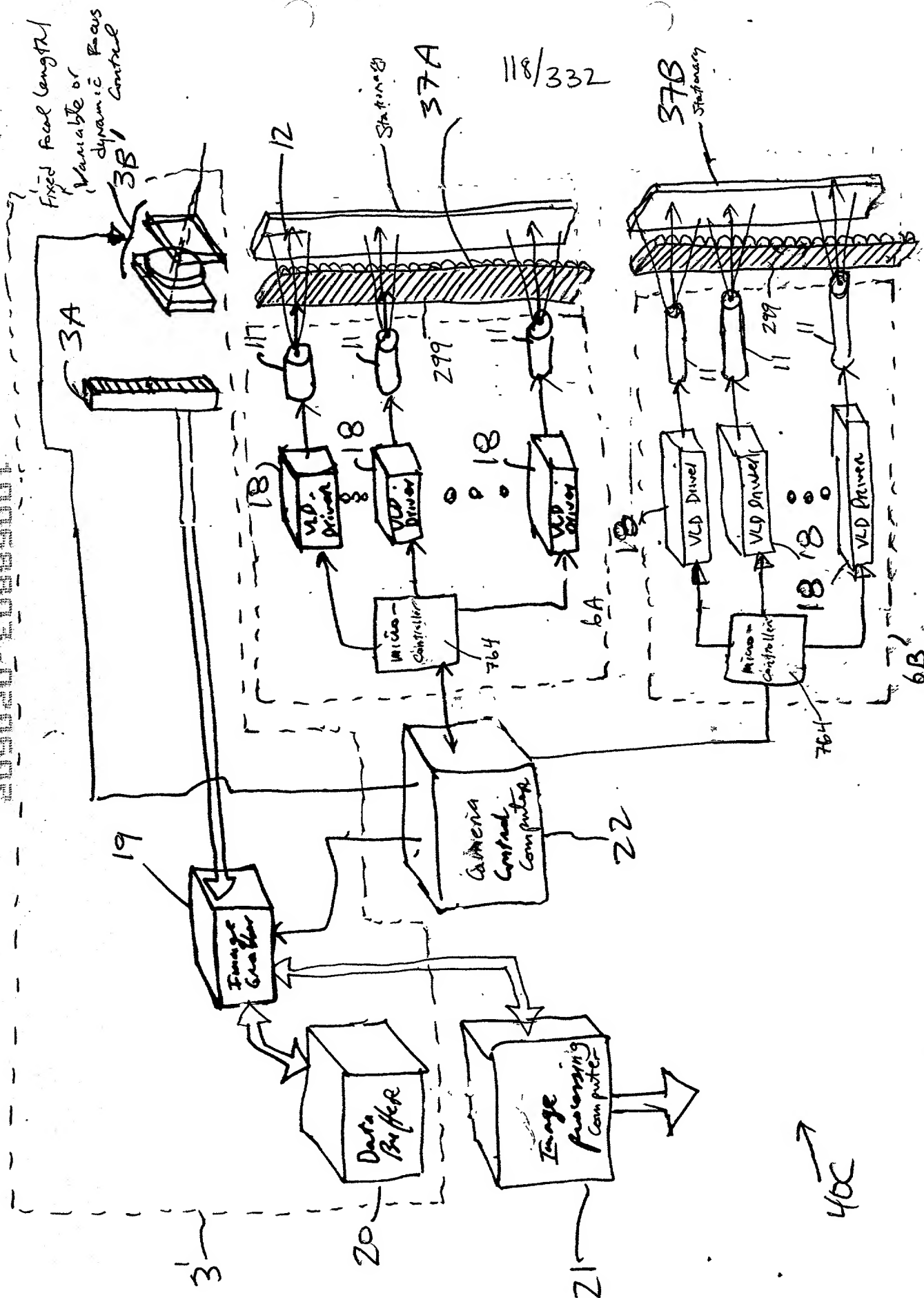


FIG. 2E2

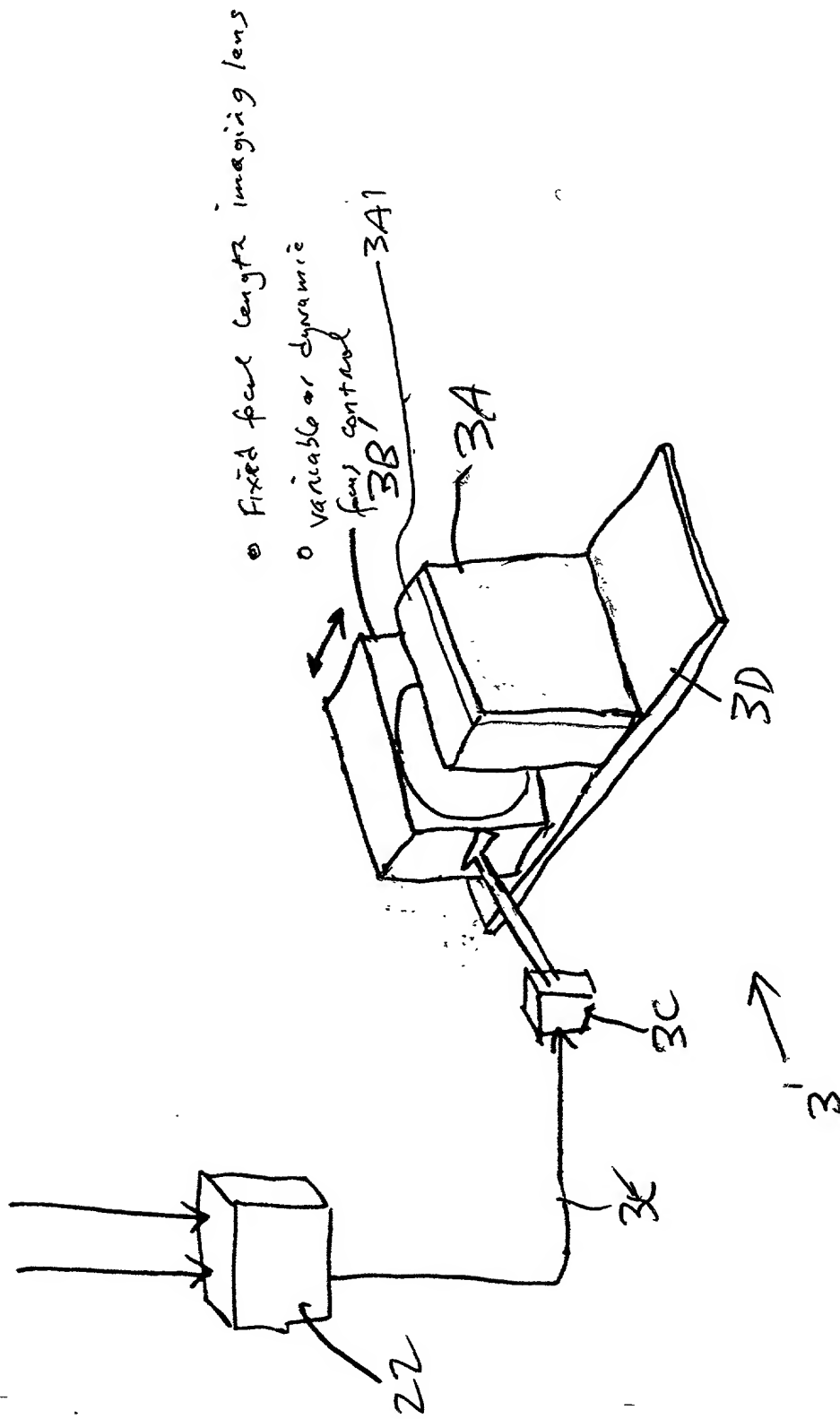


Fig. 24

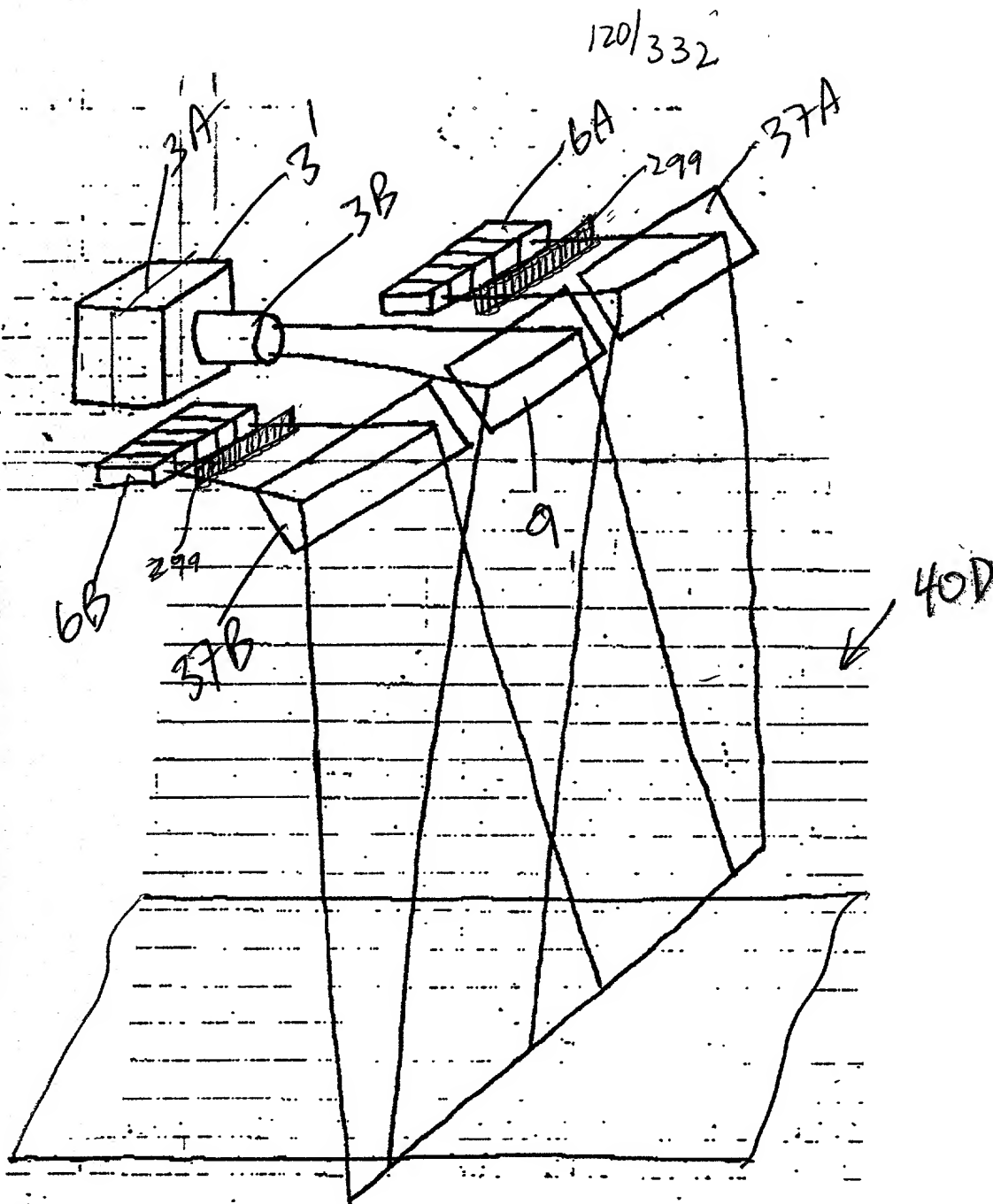


FIG. 2F1

209020* E0389001

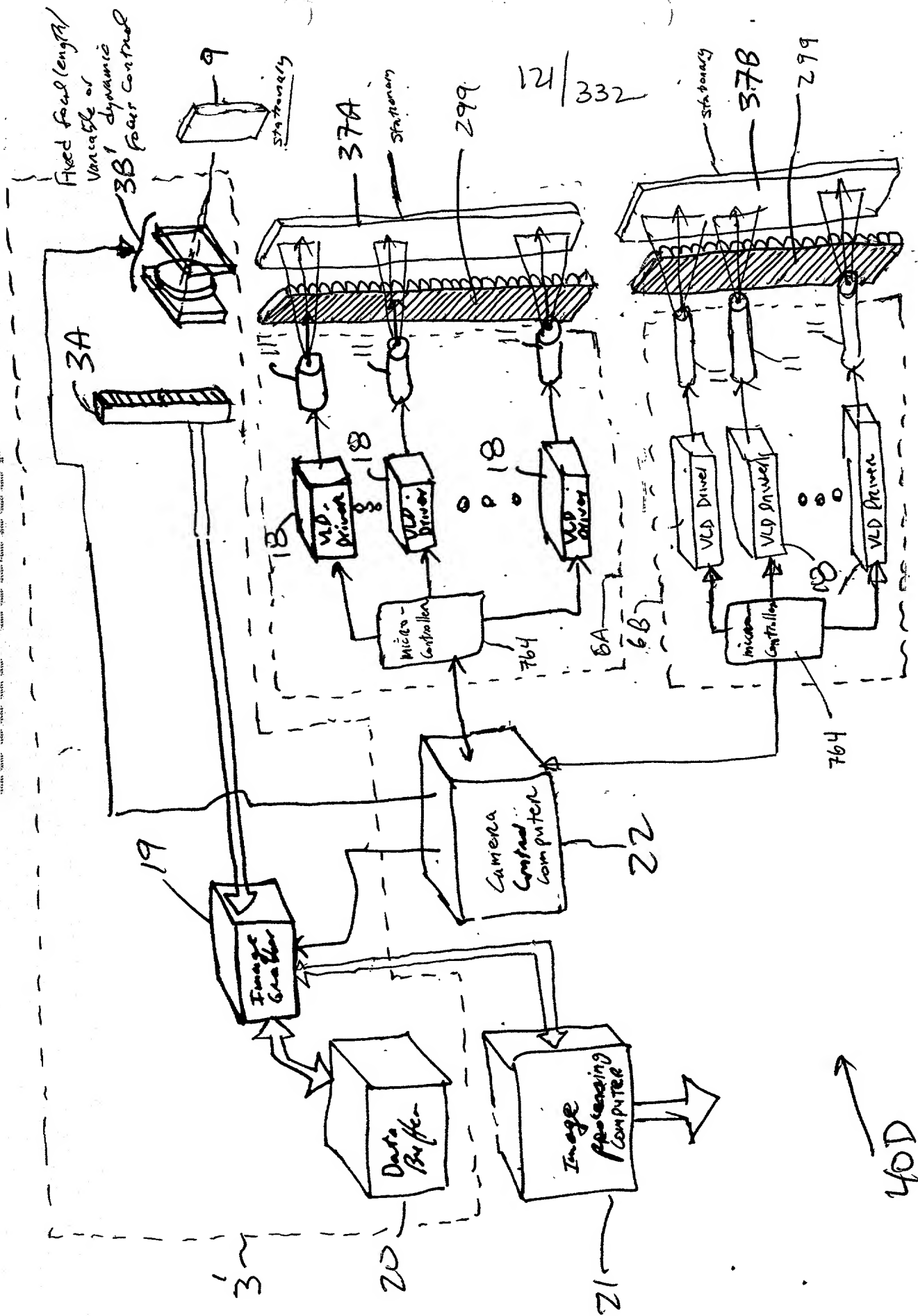


FIG. 2FZ

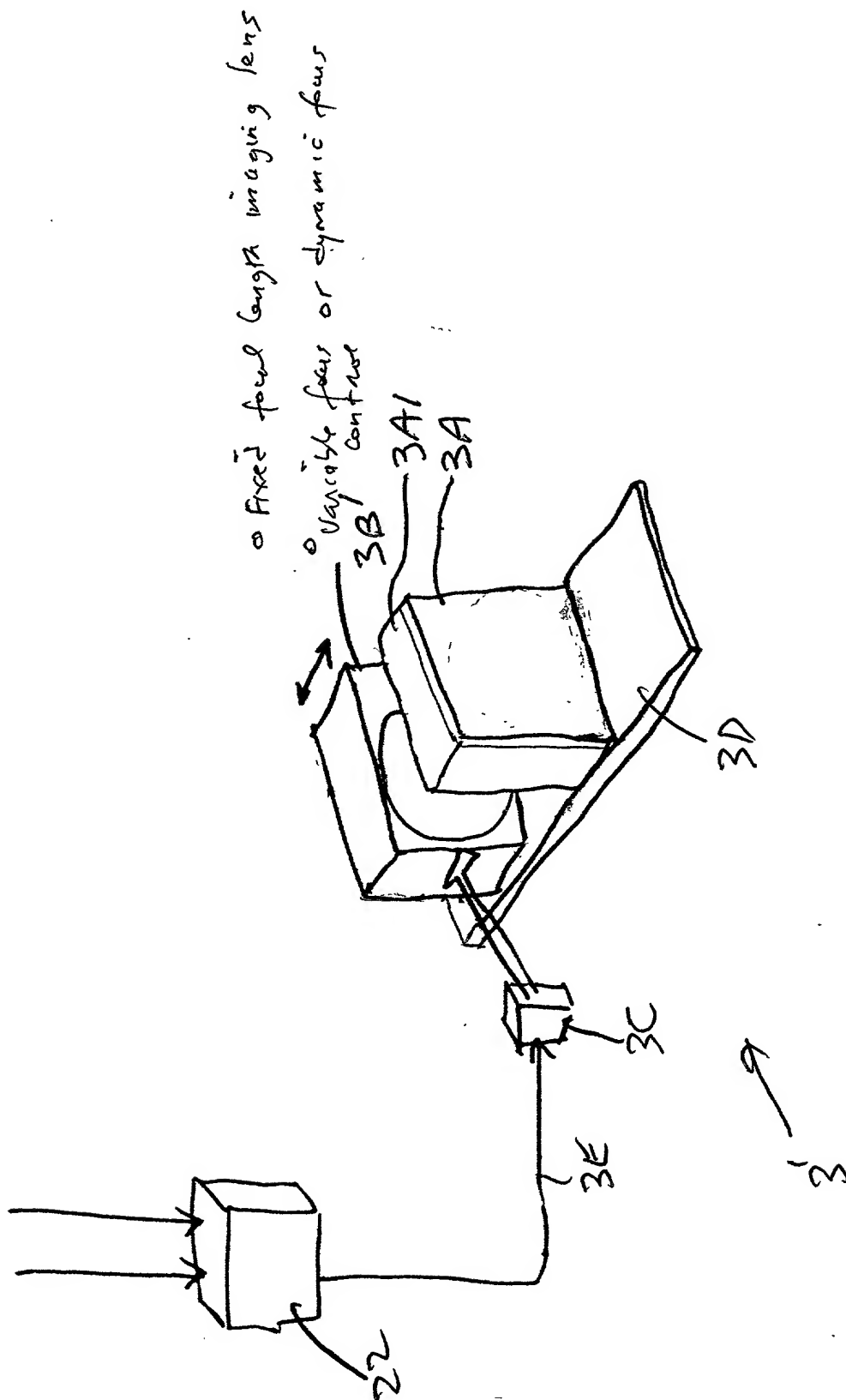


FIG. 2F3

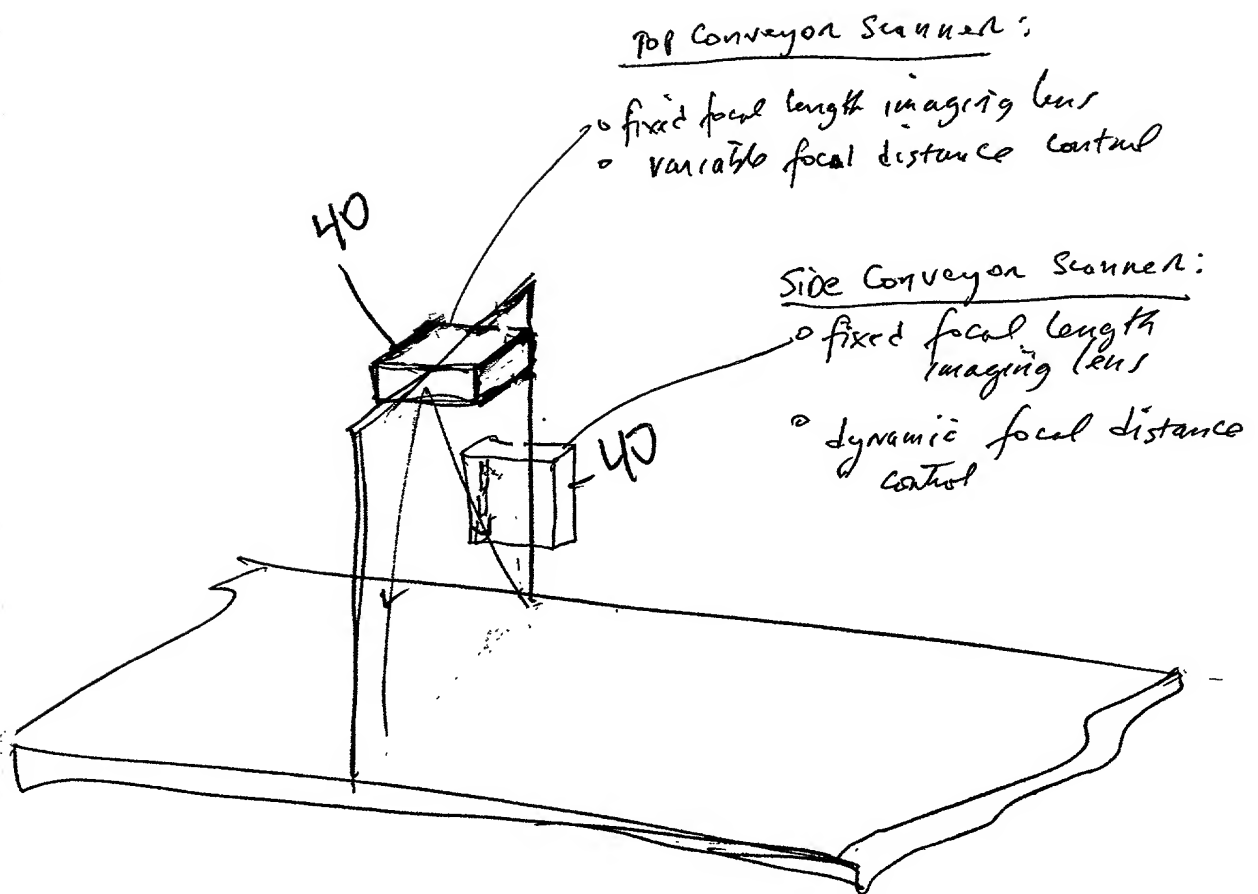


FIG. 2G

FIG. 2H

124/332
Composite
Plane of
Laser
Illumination

FOV

12

37A

299, 6A

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40C

37B

299

3A

6B

3B

3B'

Applications:
- handheld scanner
- presentation scanner

FIG. 2H

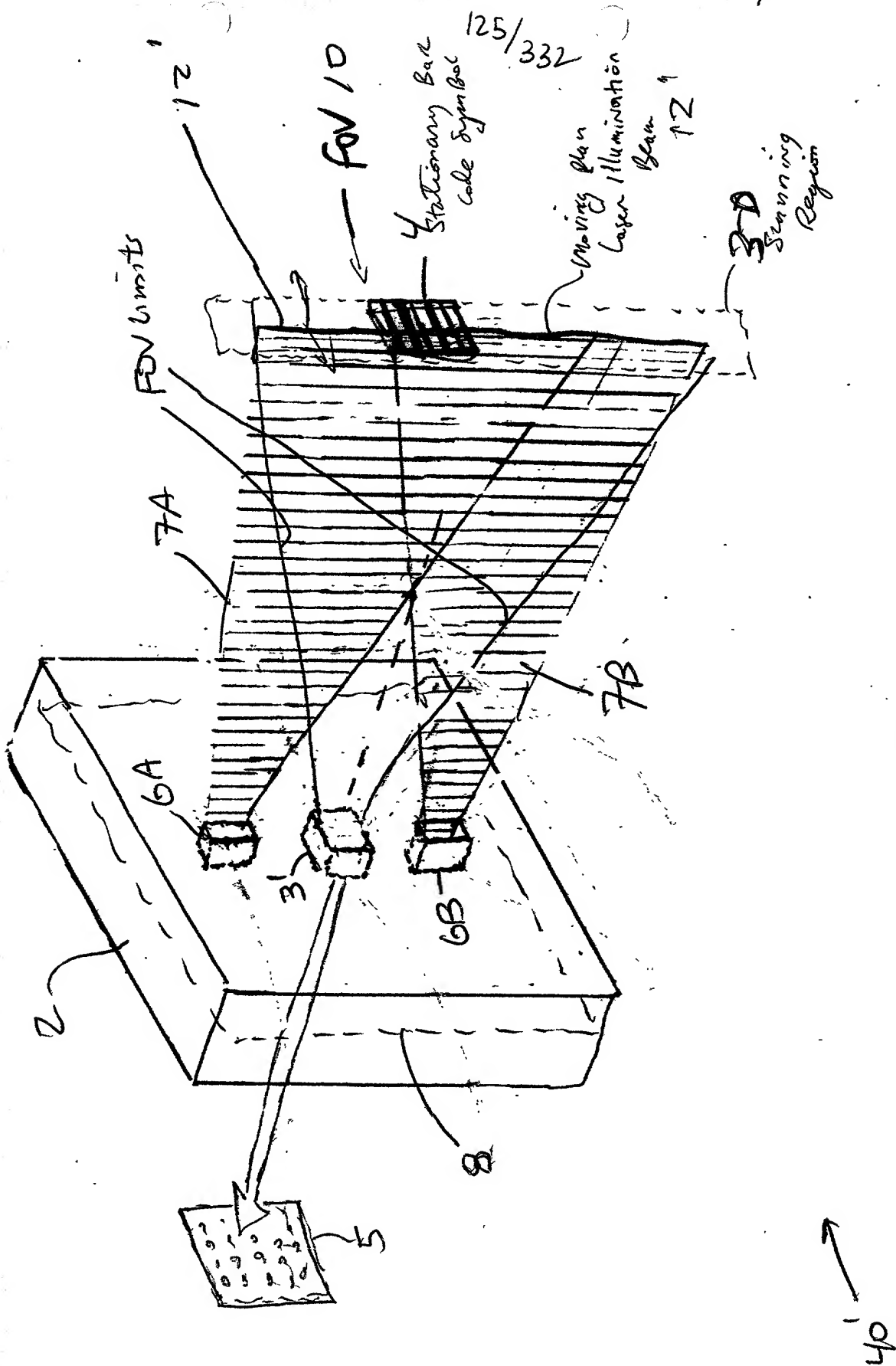


FIG. 2II

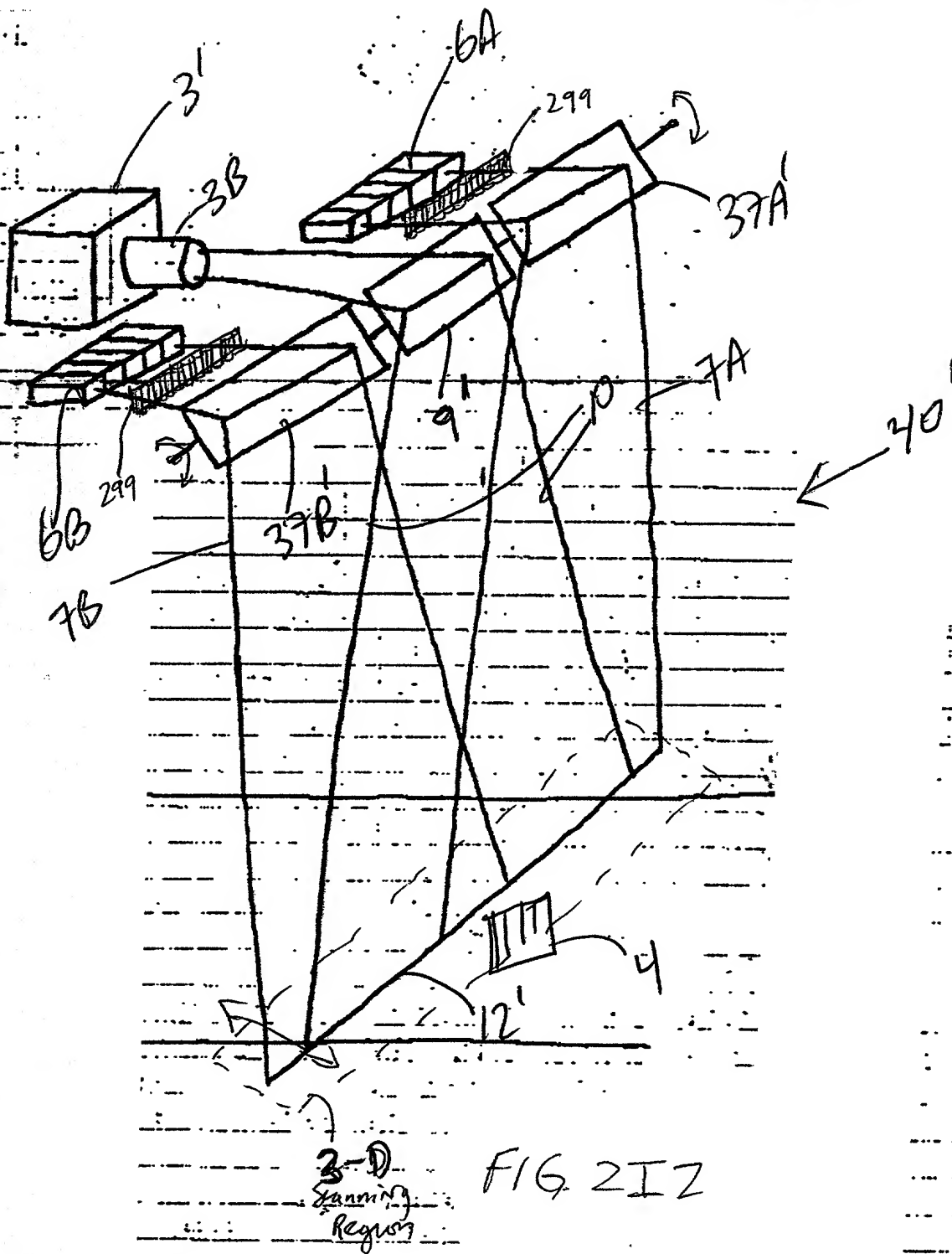


FIG 2I Z

209020-00339003

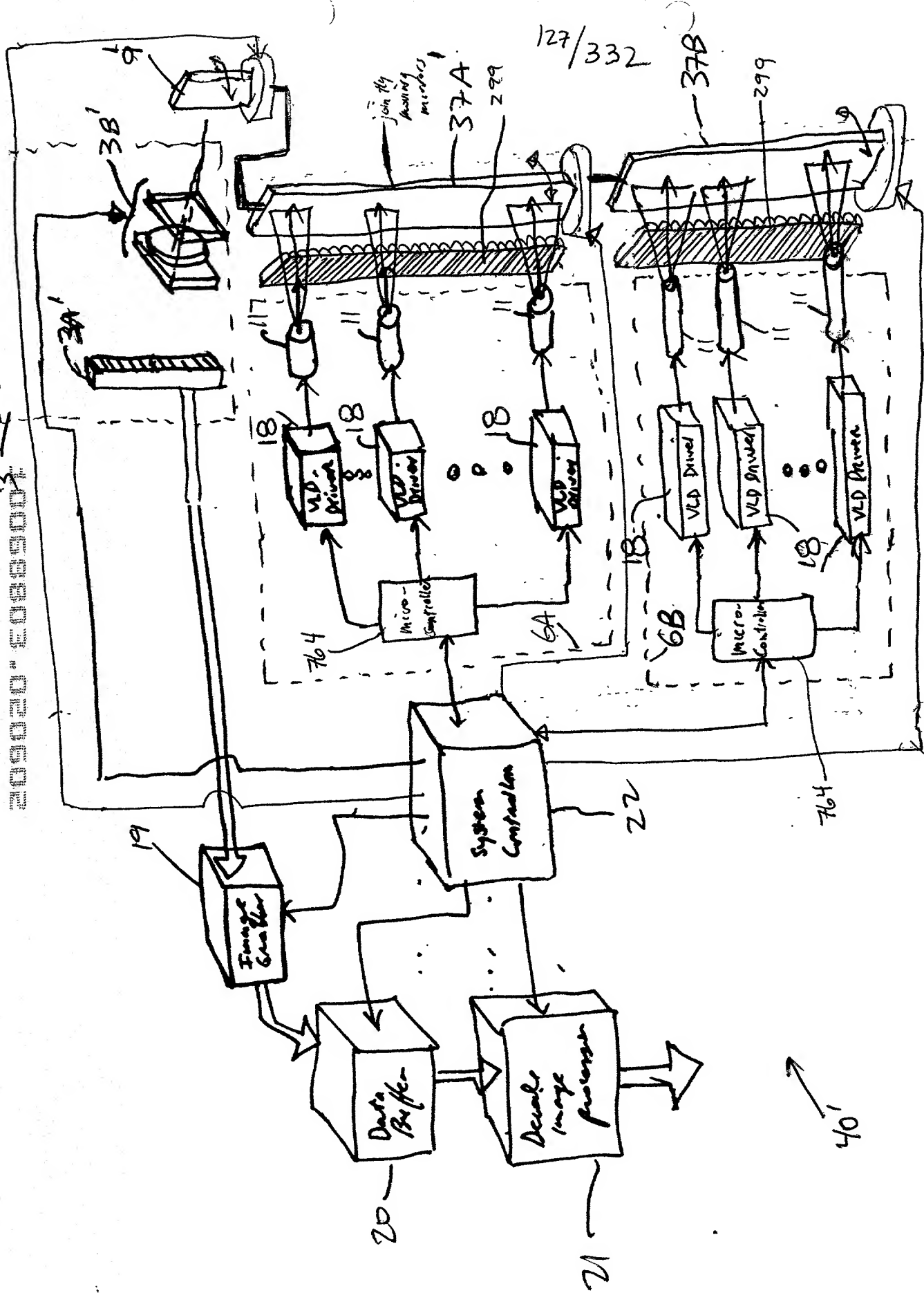


FIG. 2I3

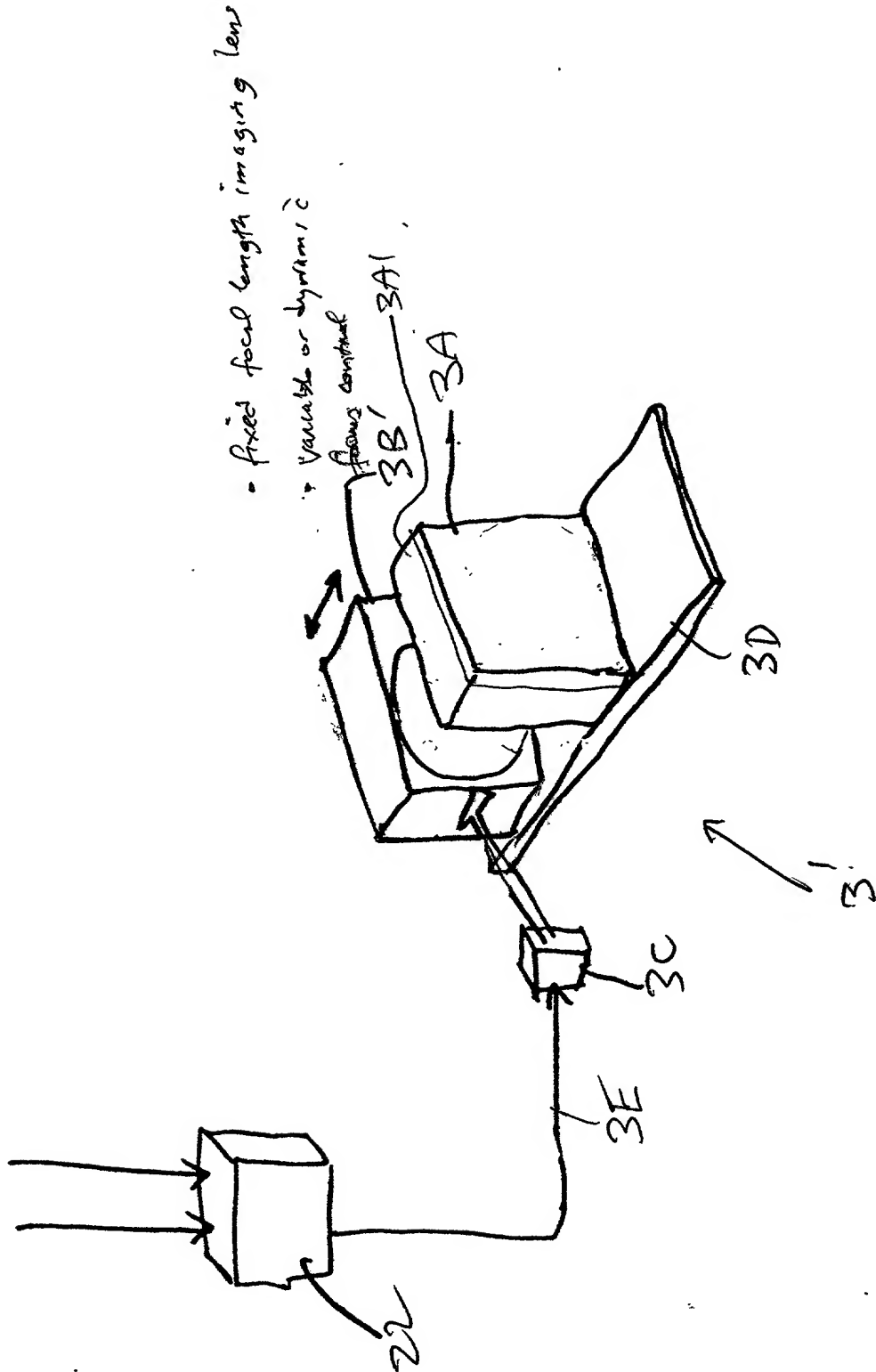


FIG. 2I4

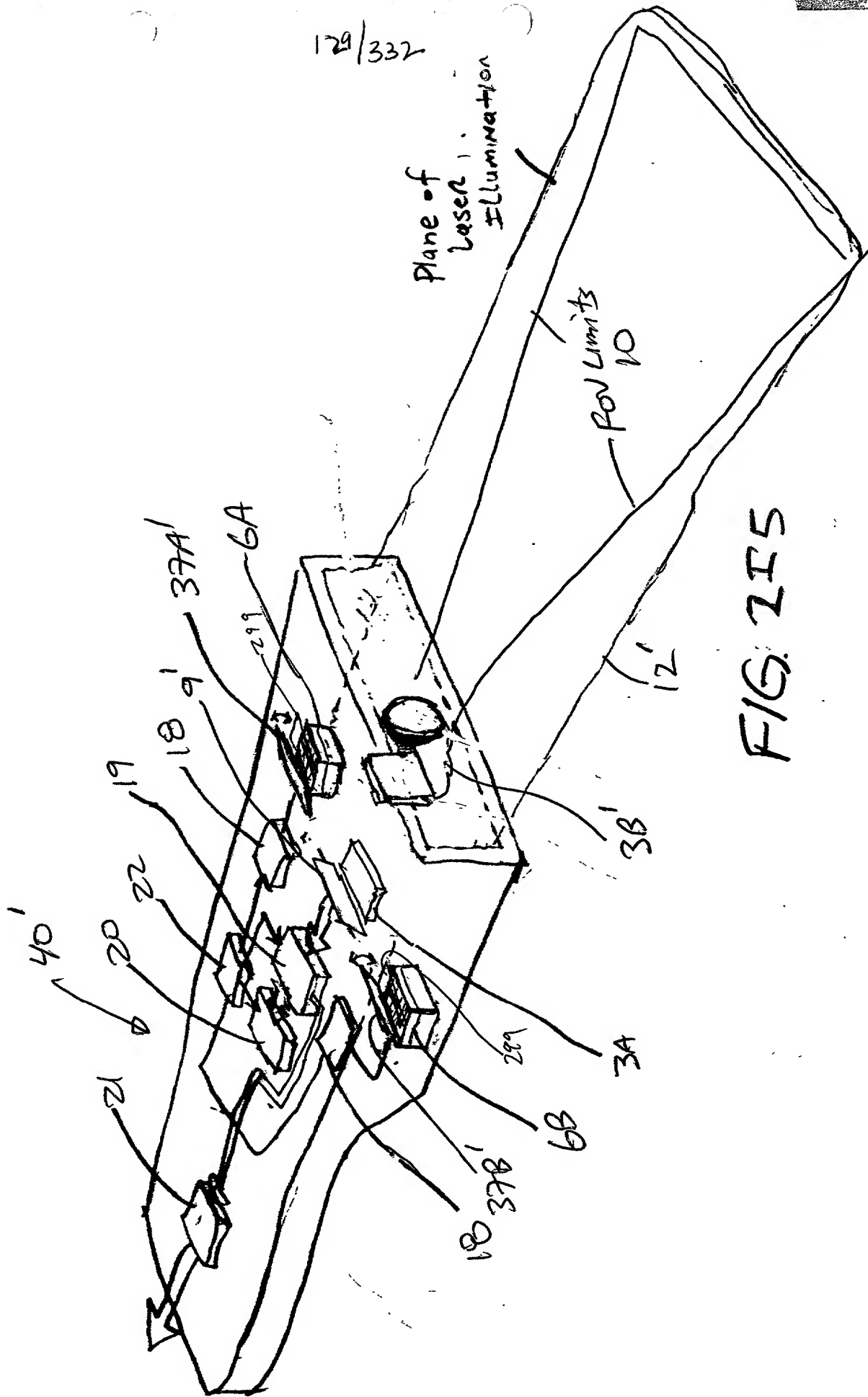


FIG. 215

10068803-020602

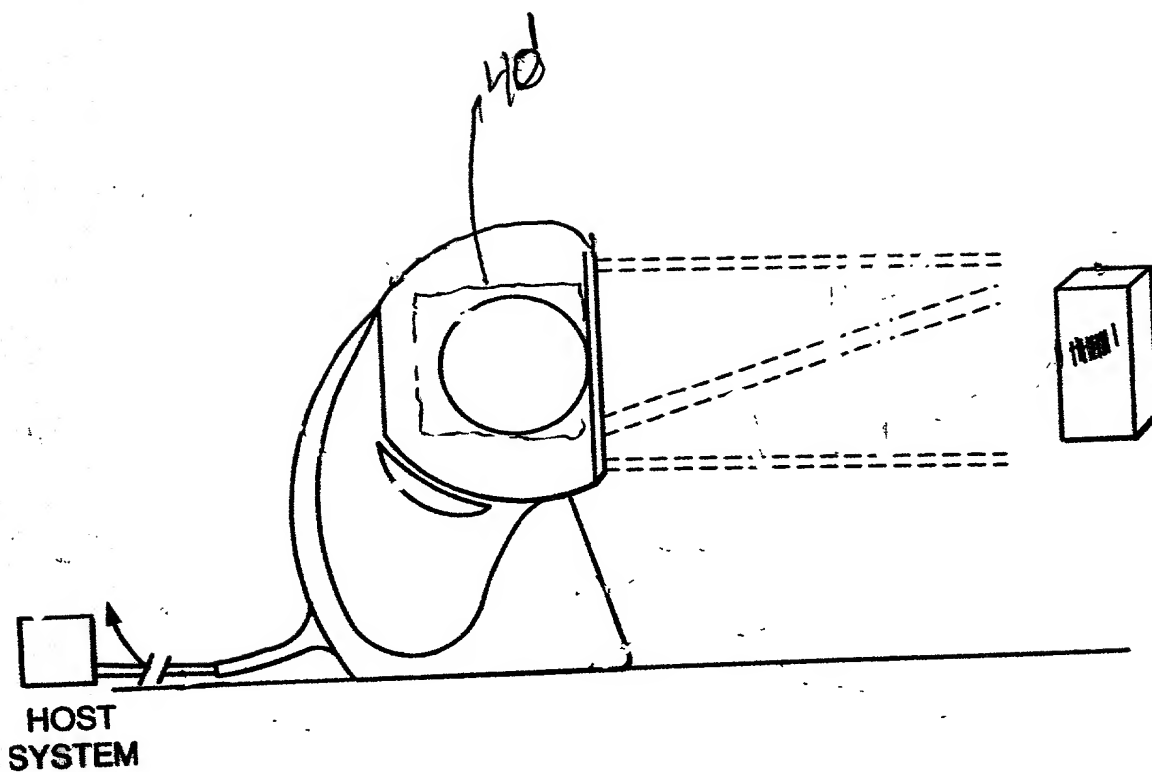


FIG. 2I6

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FIG 3A

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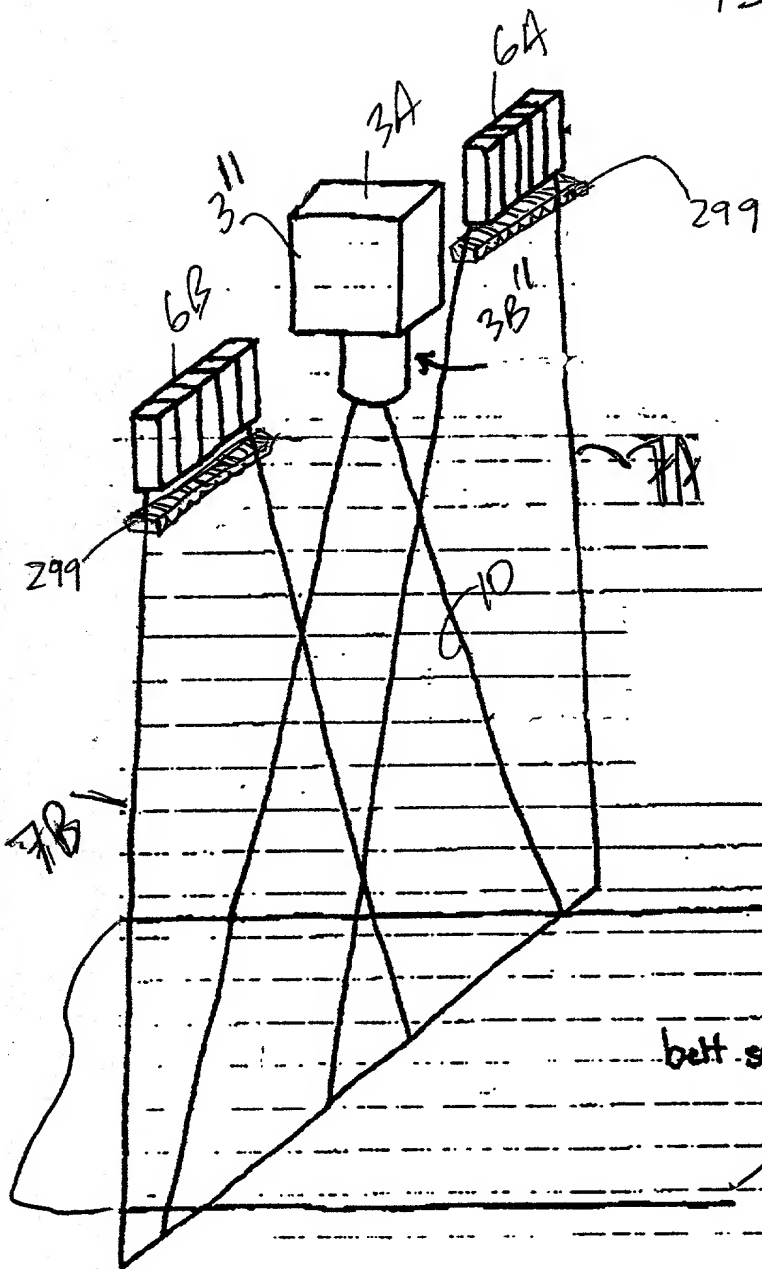


FIG. 3B1

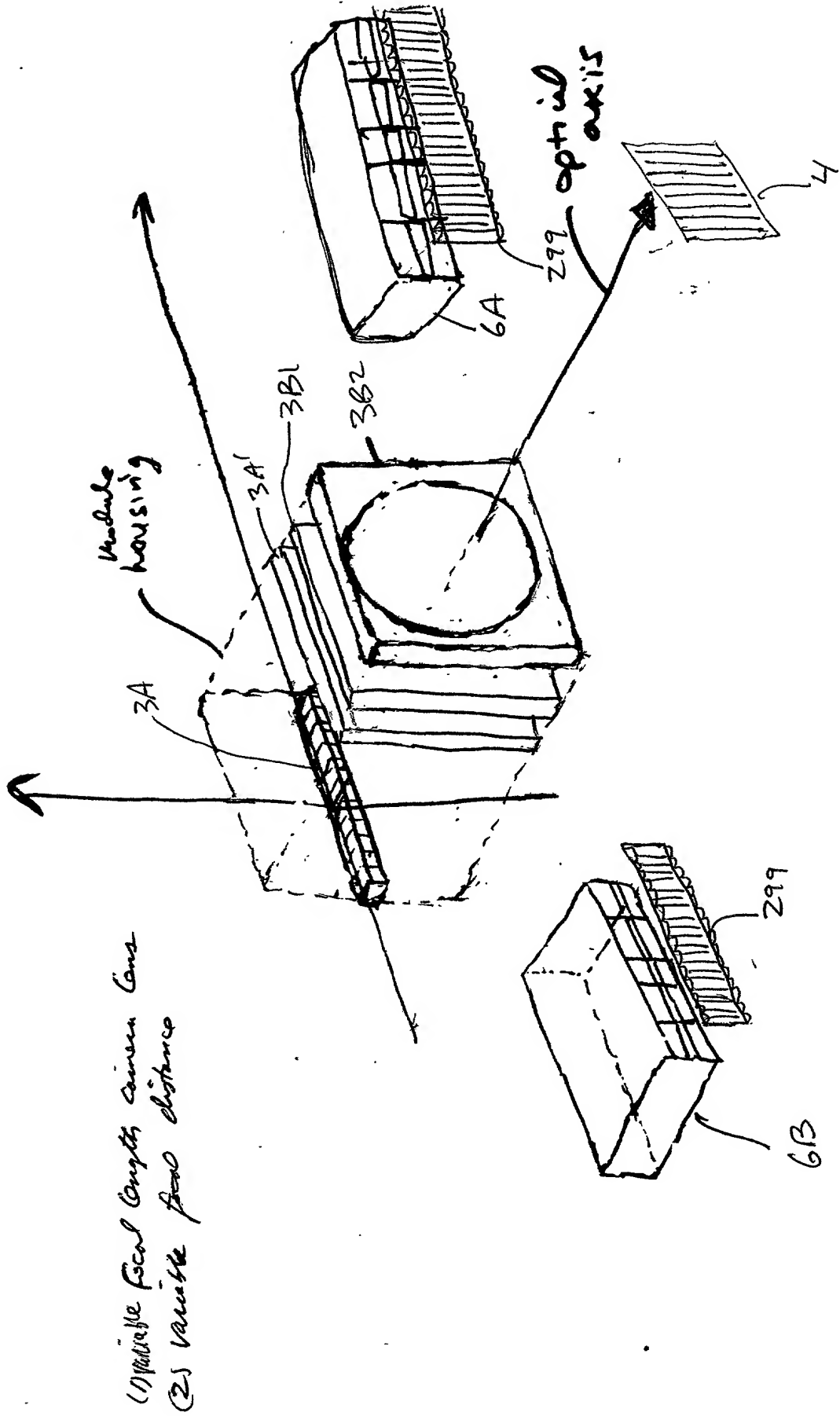


FIG. 382

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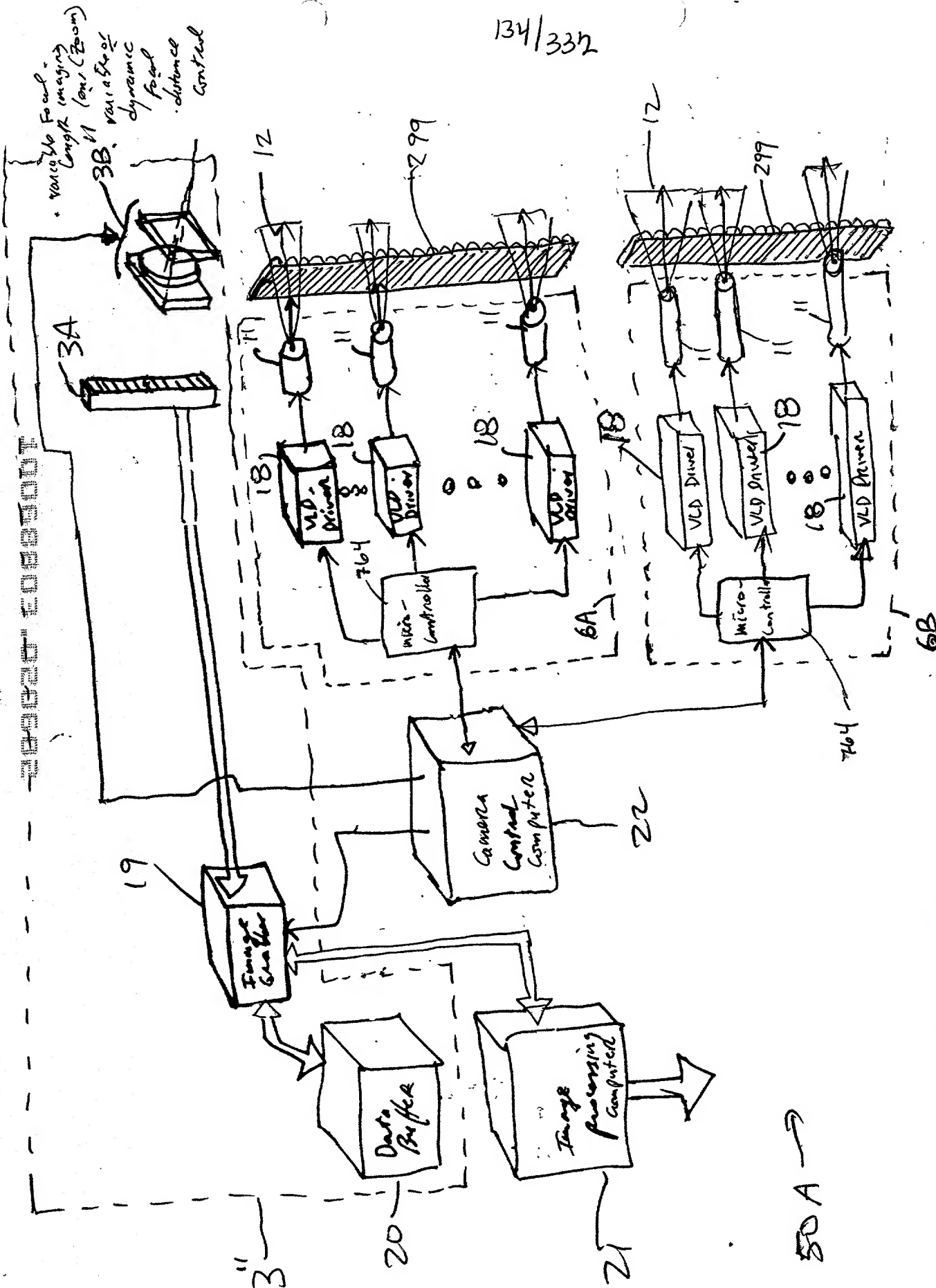


FIG 3C1

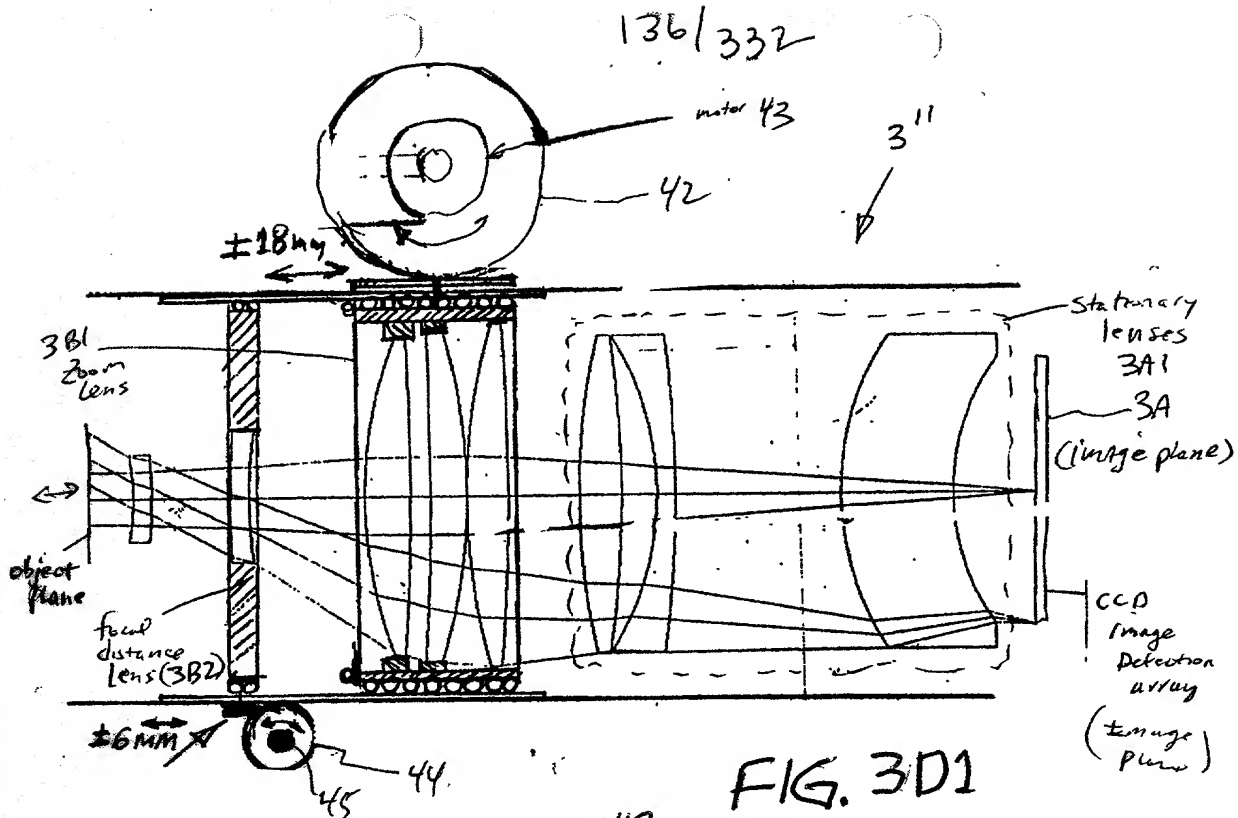


FIG. 3D1

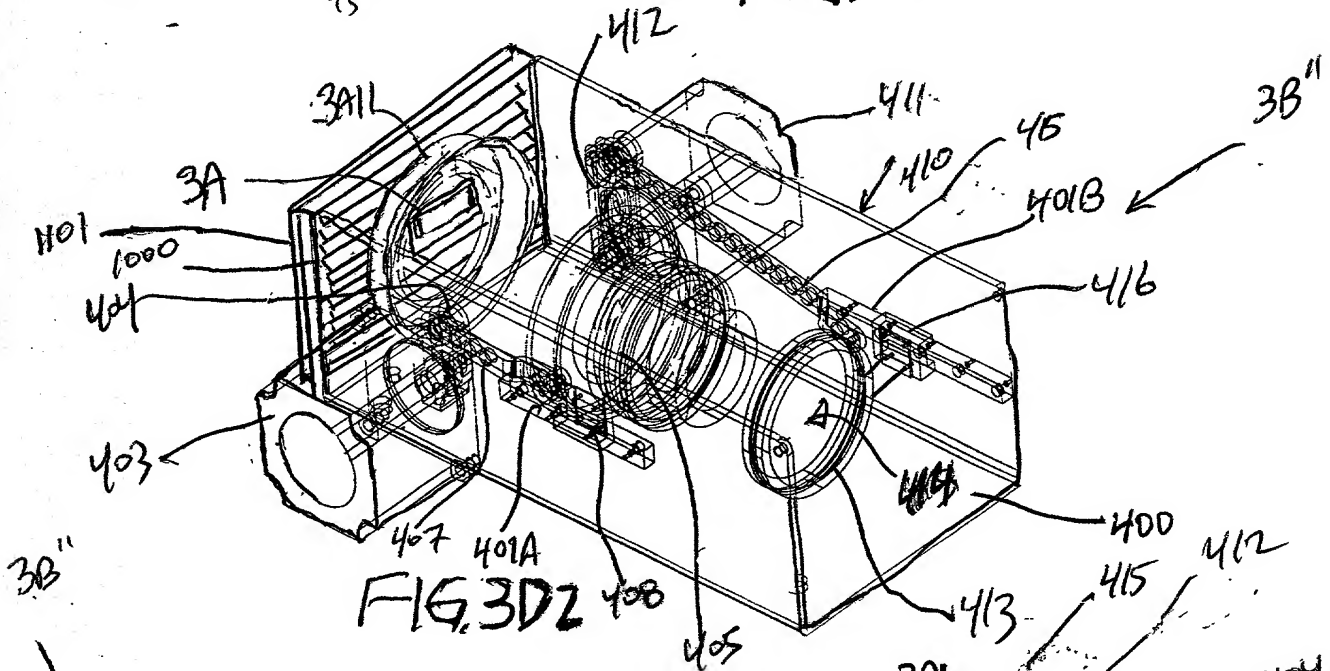


FIG. 3D2

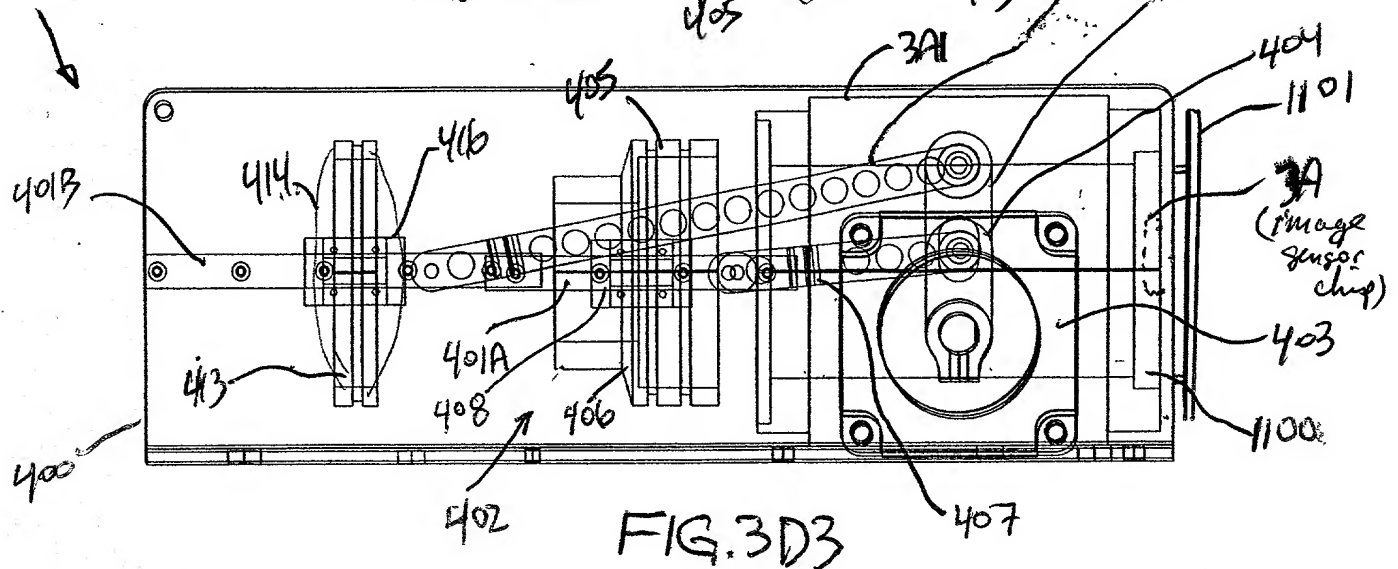


FIG. 3D3

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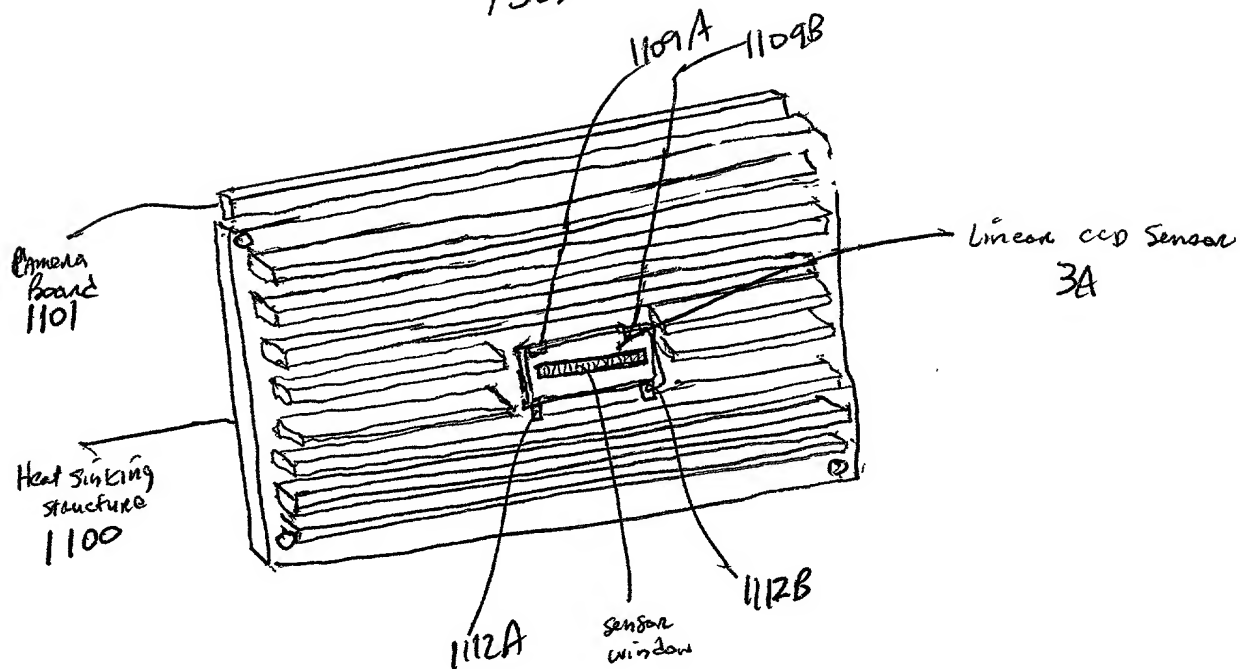
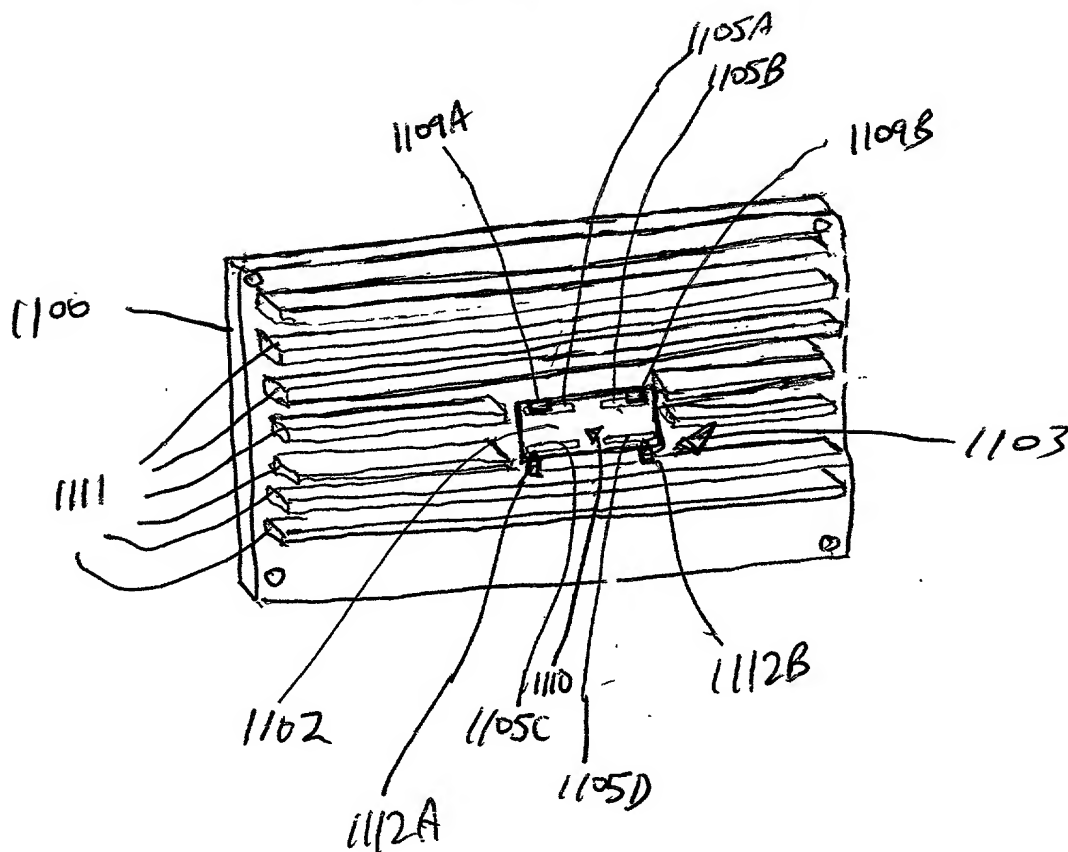


FIG. 3D4



F1 G. 3D5

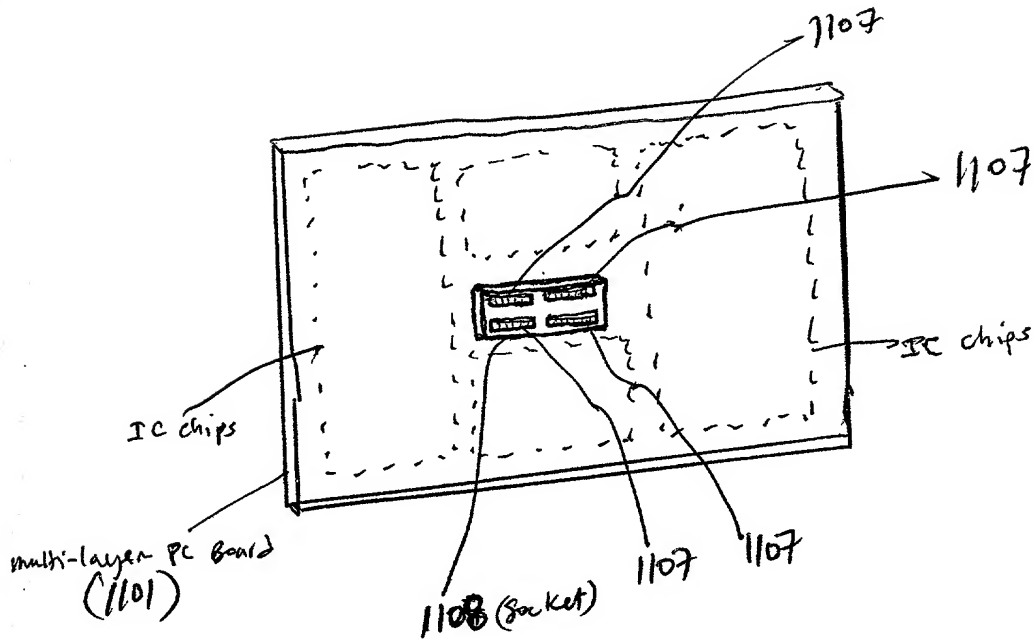


FIG. 3D6

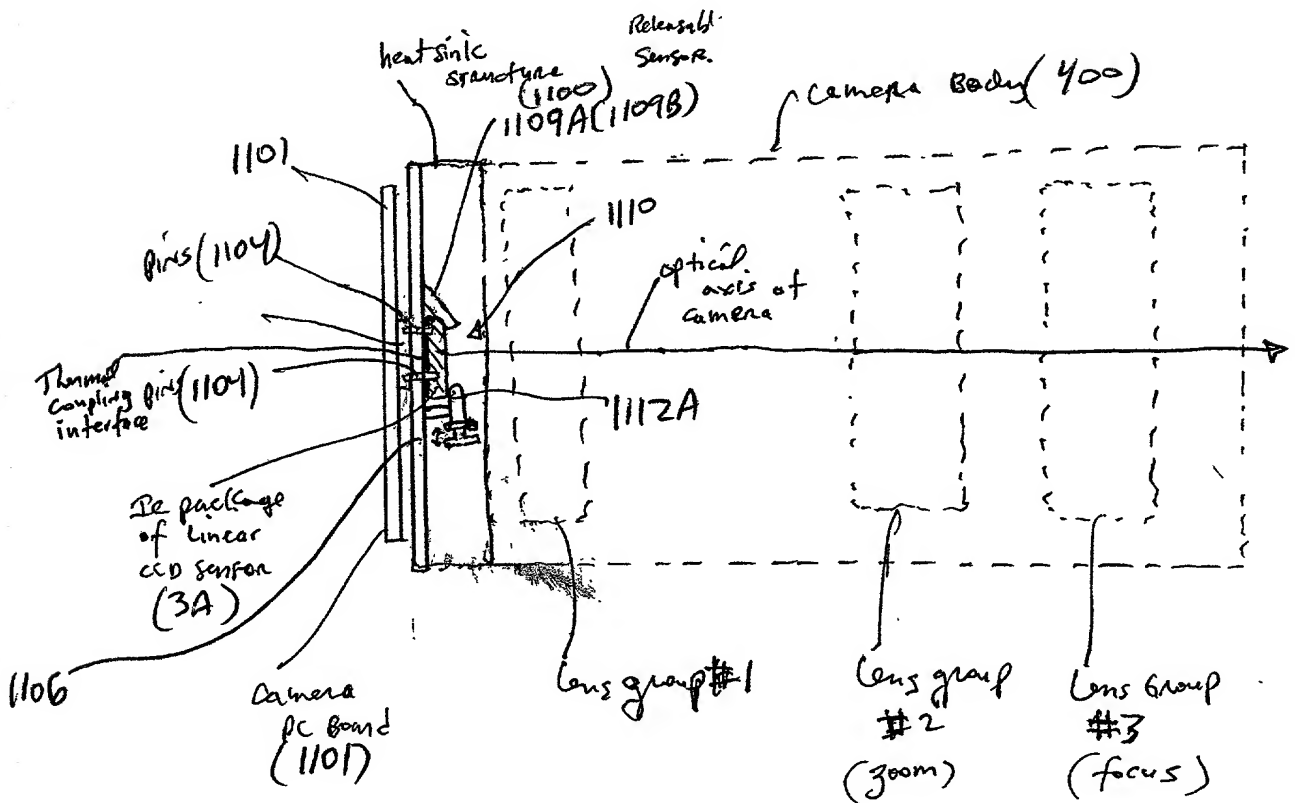
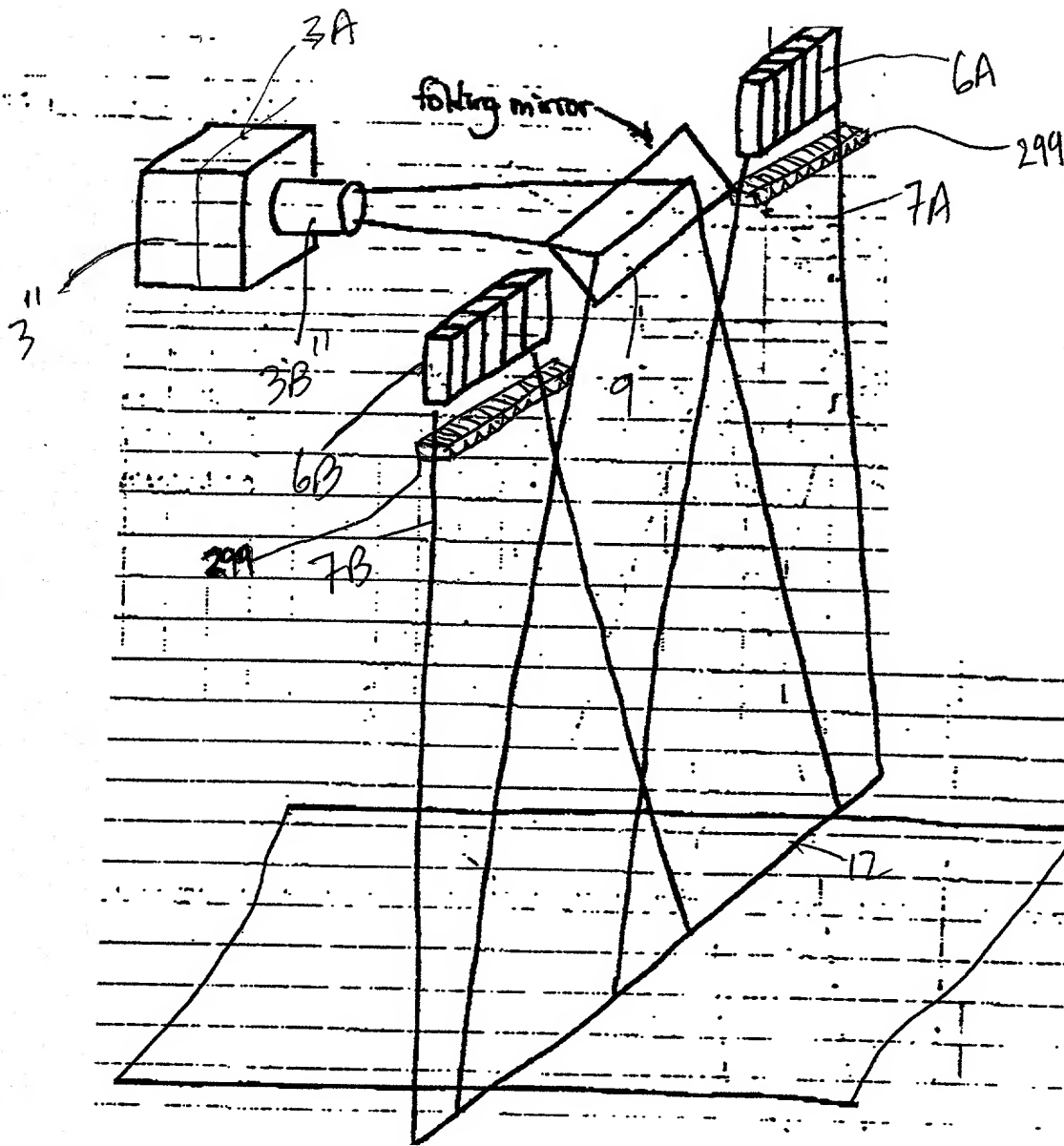


FIG. 3D7

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FIG. 3E1

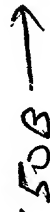
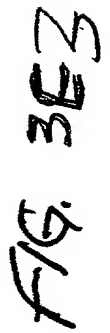
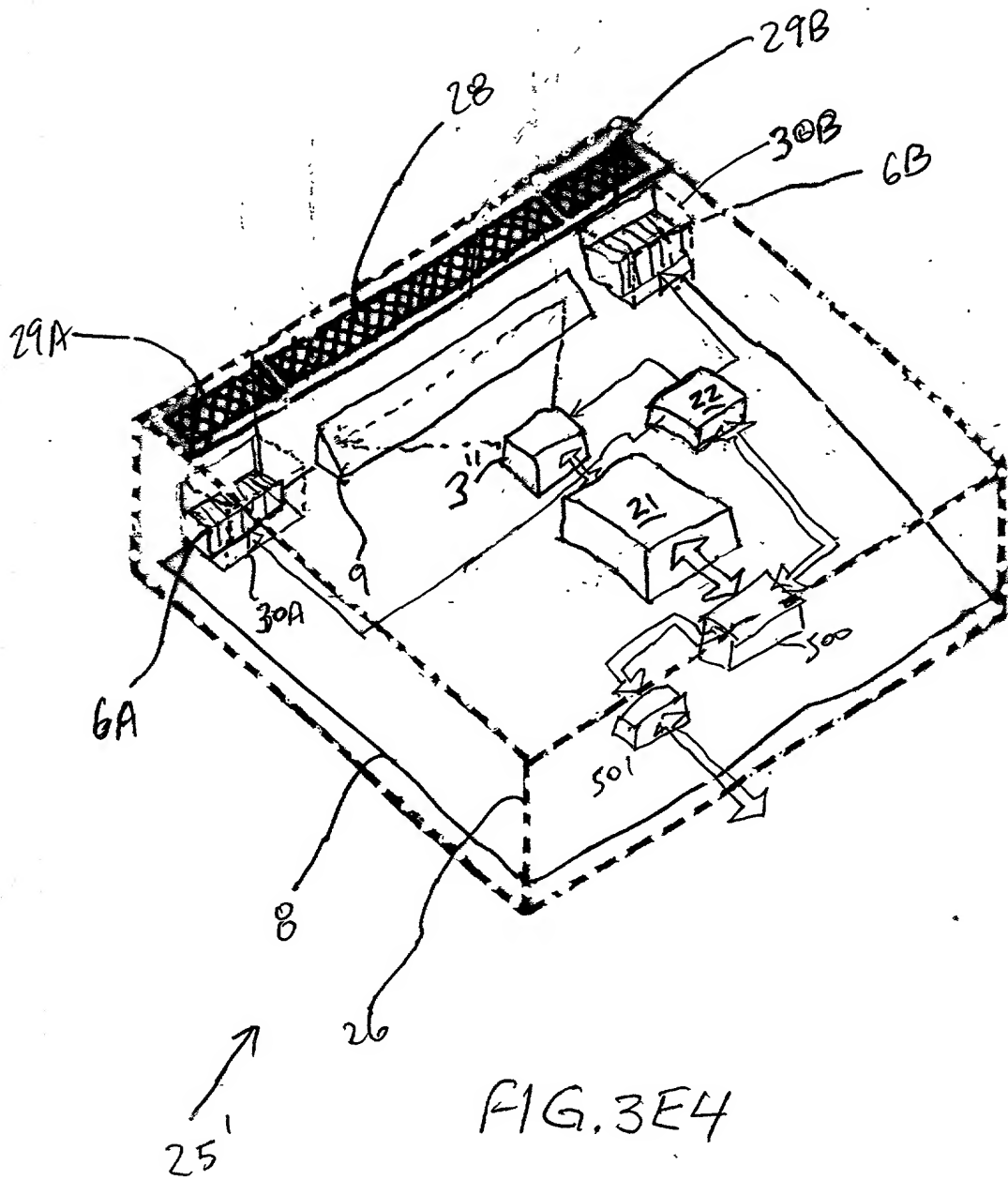


FIG. 3E2



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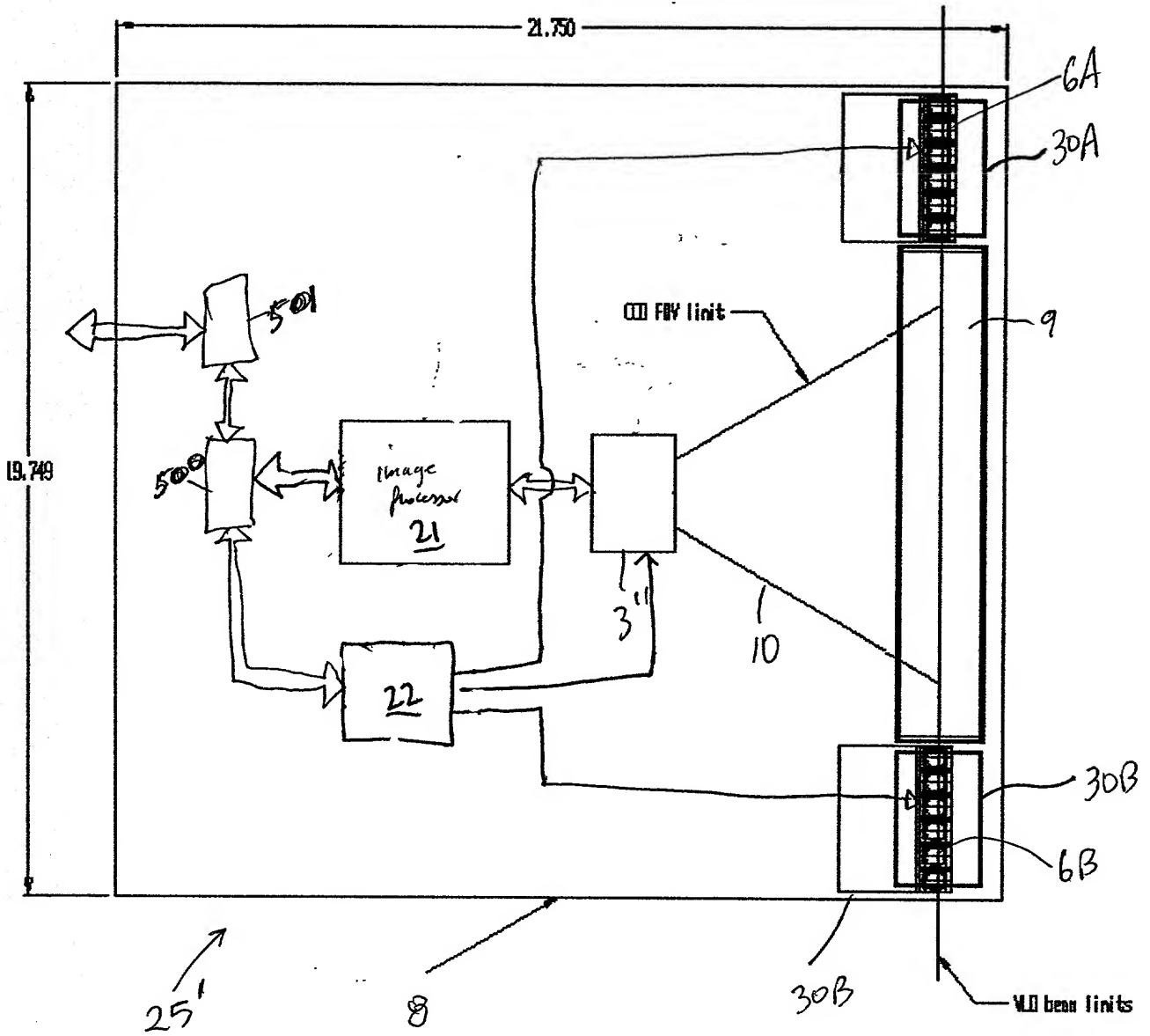


FIG. 3E5

100

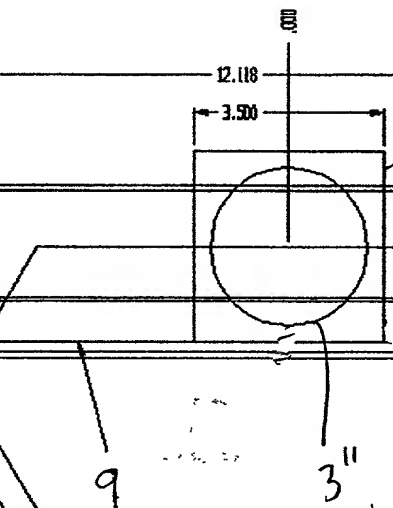


FIG. 3E6

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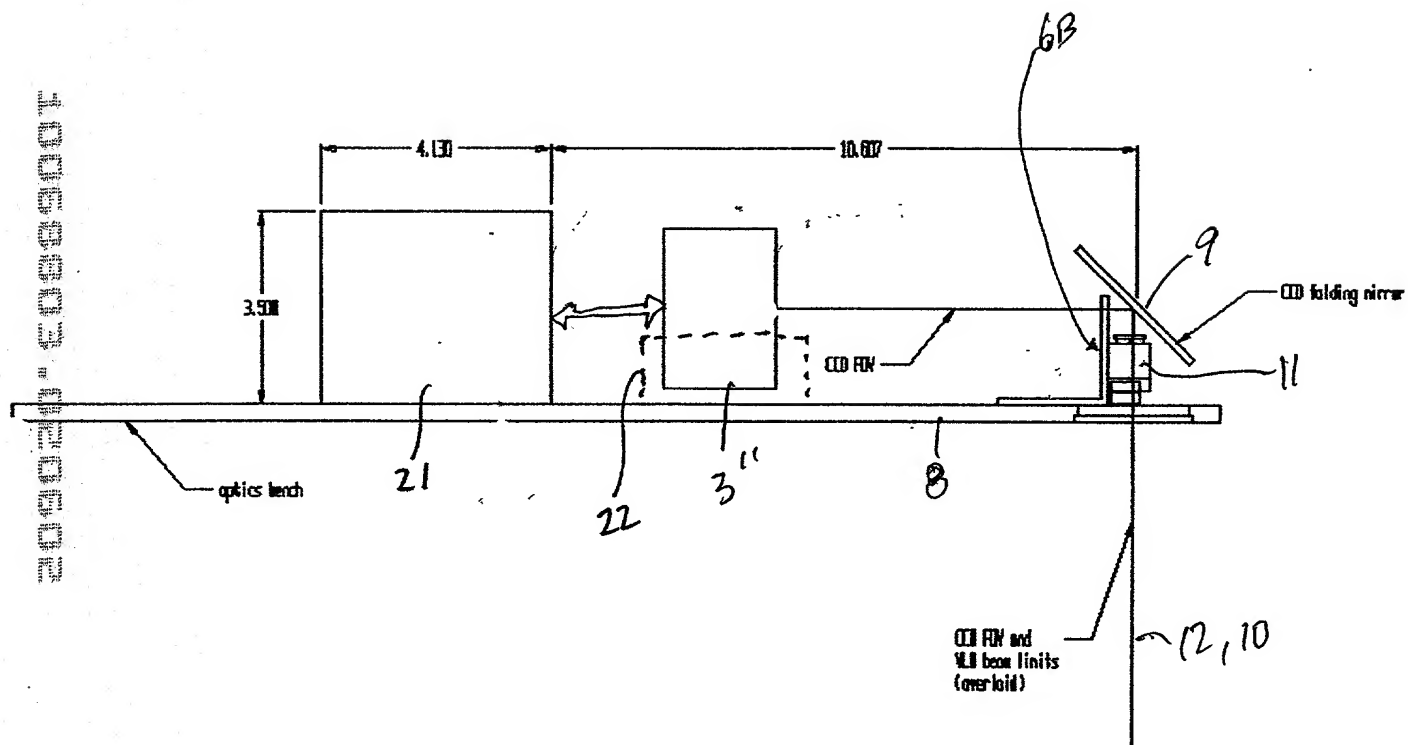


FIG. 3E7

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*Variable FOV

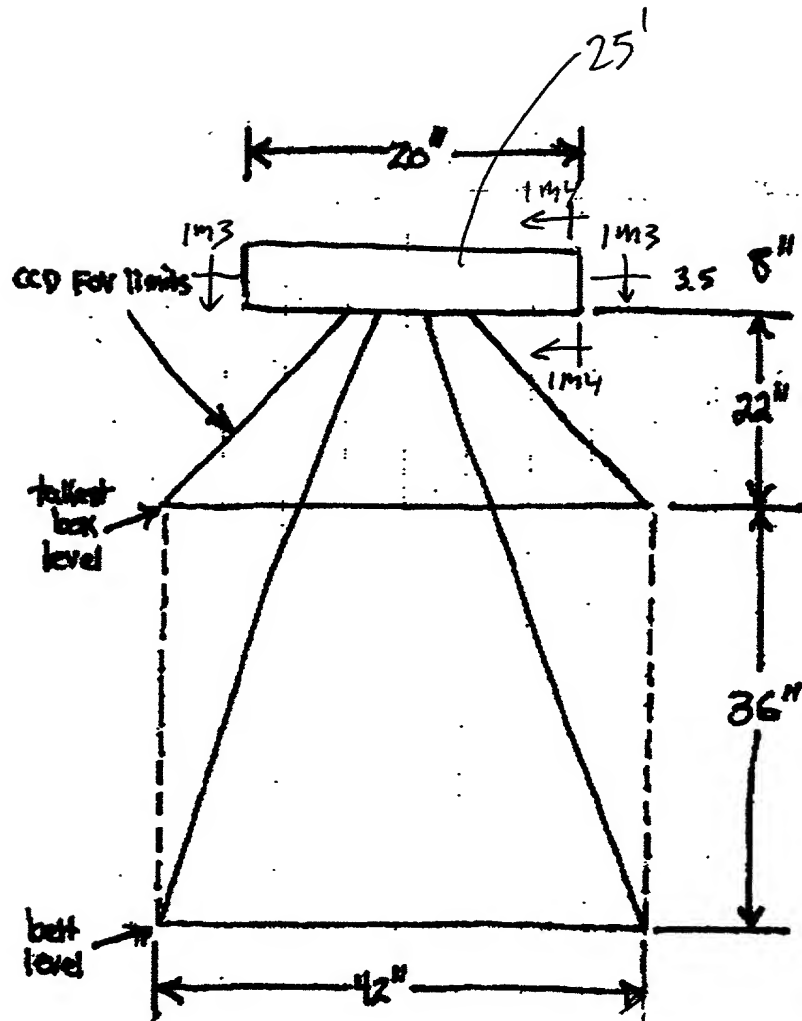


FIG. 3E8

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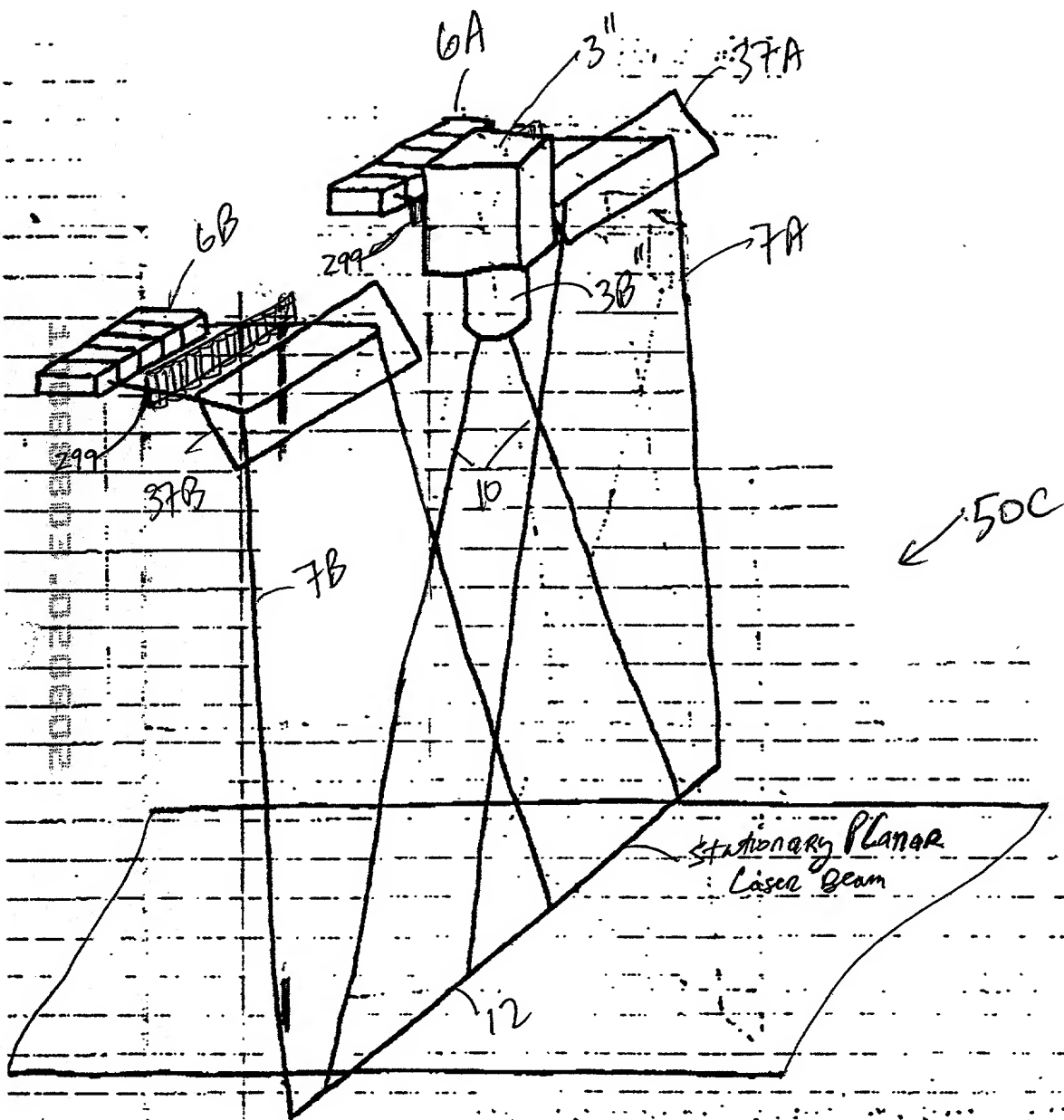


FIG 3F1

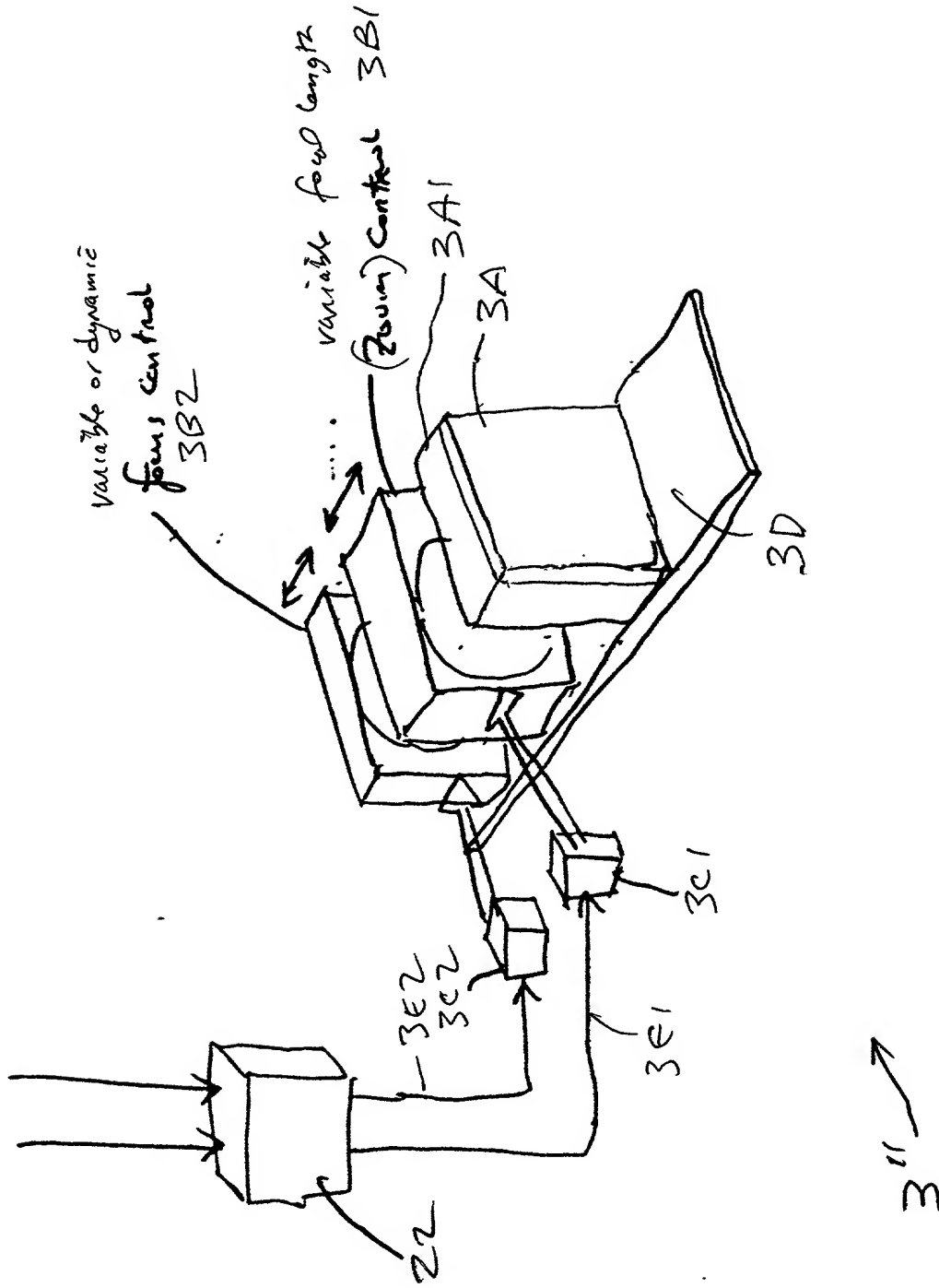
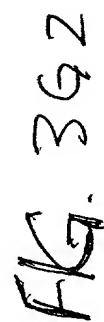


FIG. 3F3



50

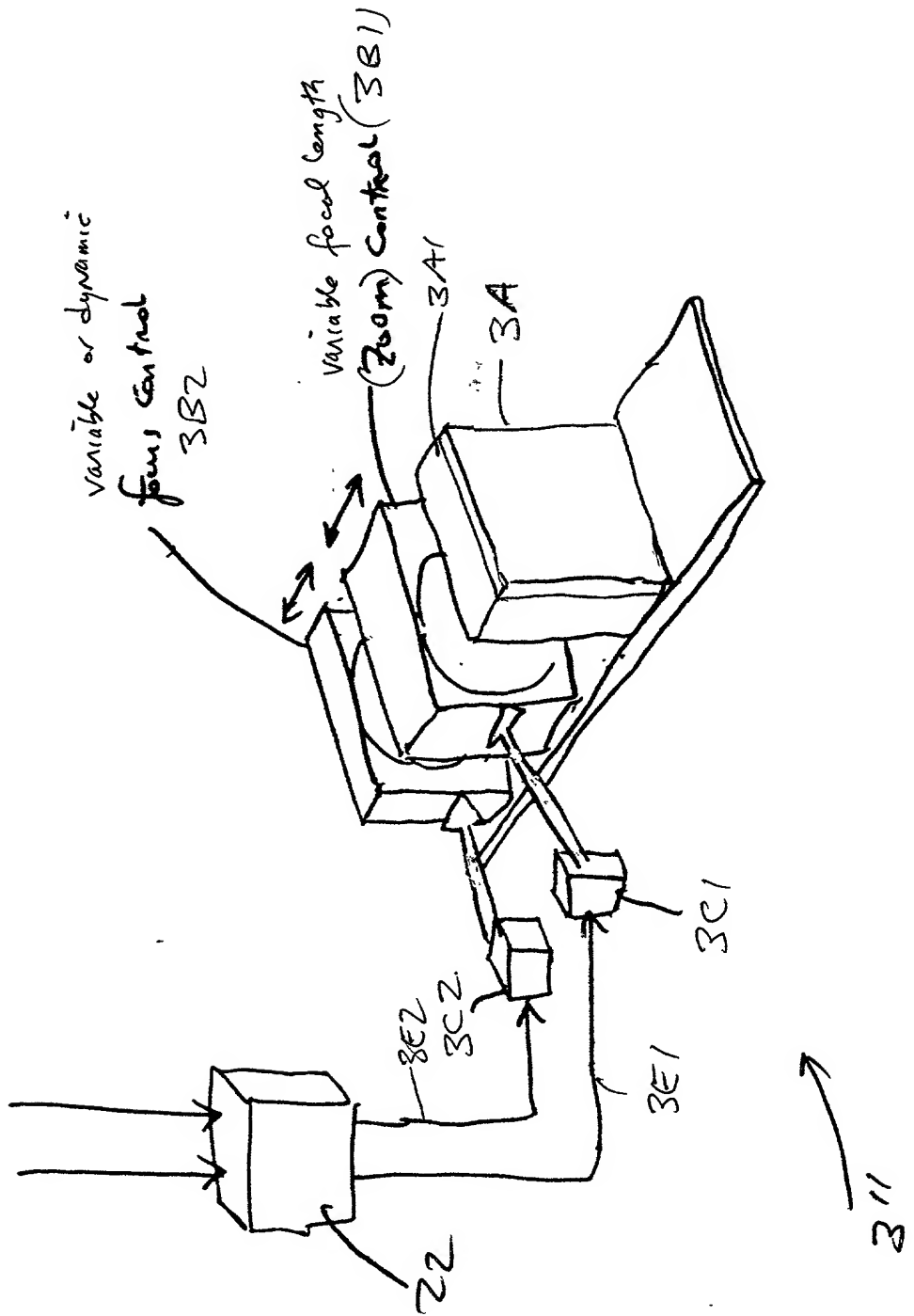


FIG. 3G3

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40 variable focal length imaging lens
• variable focal distance

50 variable focal length imaging lens
dynamic focal distance

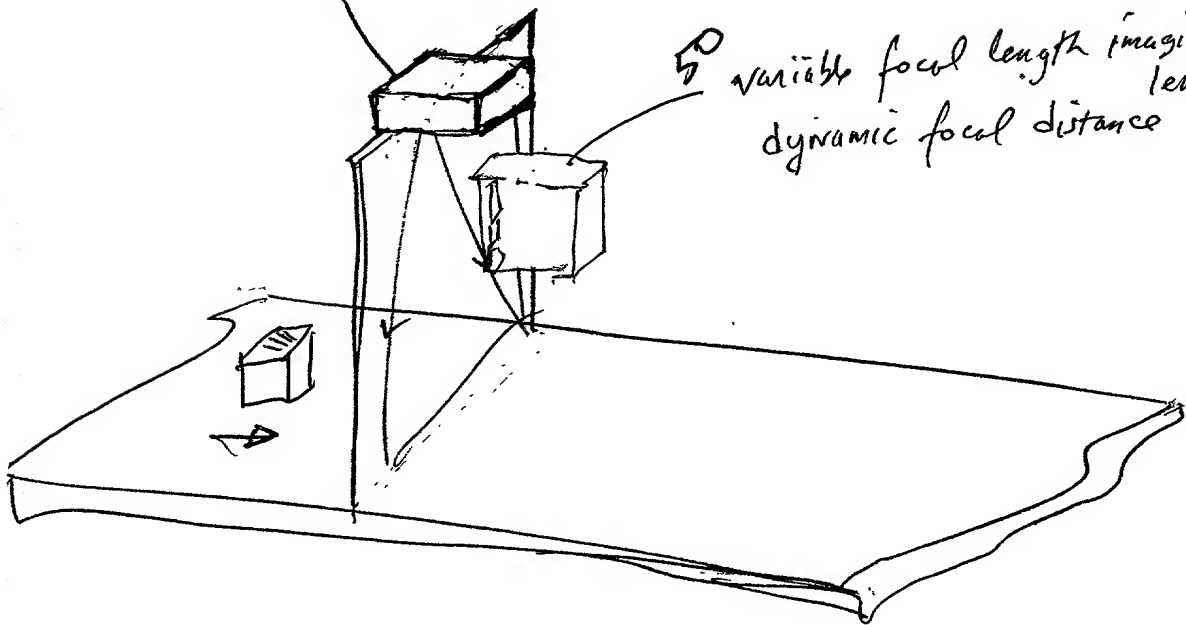


FIG. 3H

2009020-20889001

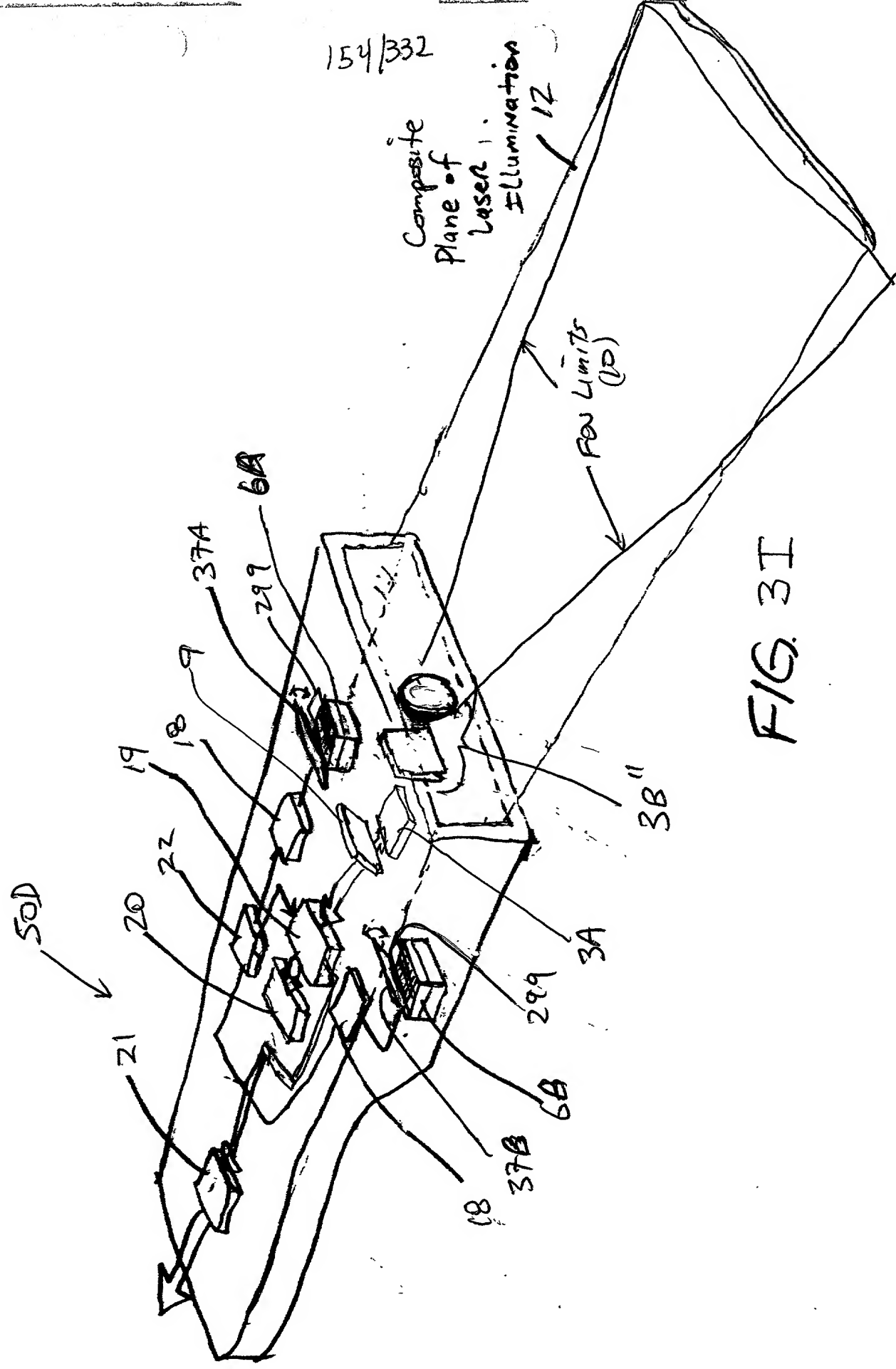


FIG. 3I

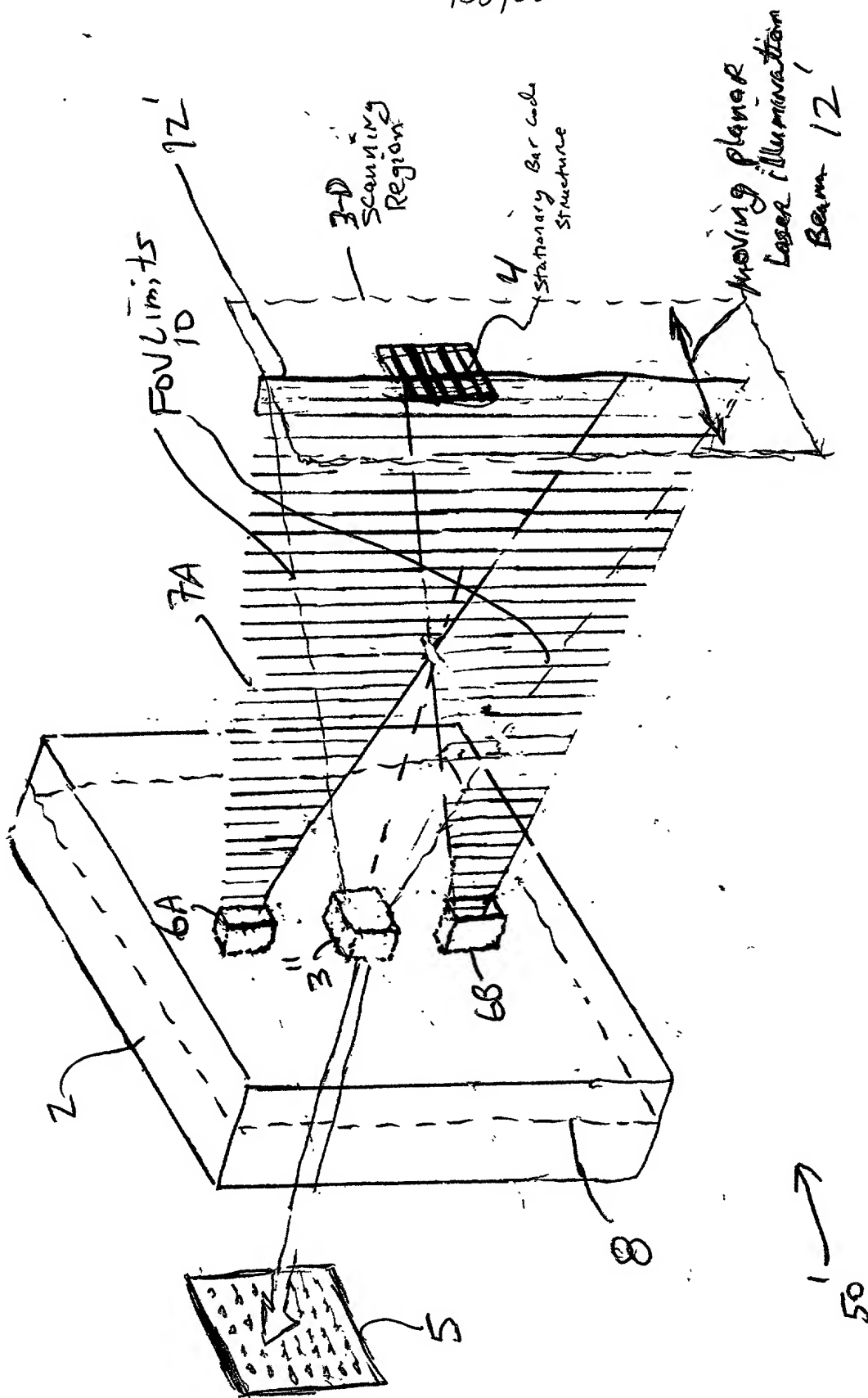


FIG. 3J1

15b/332

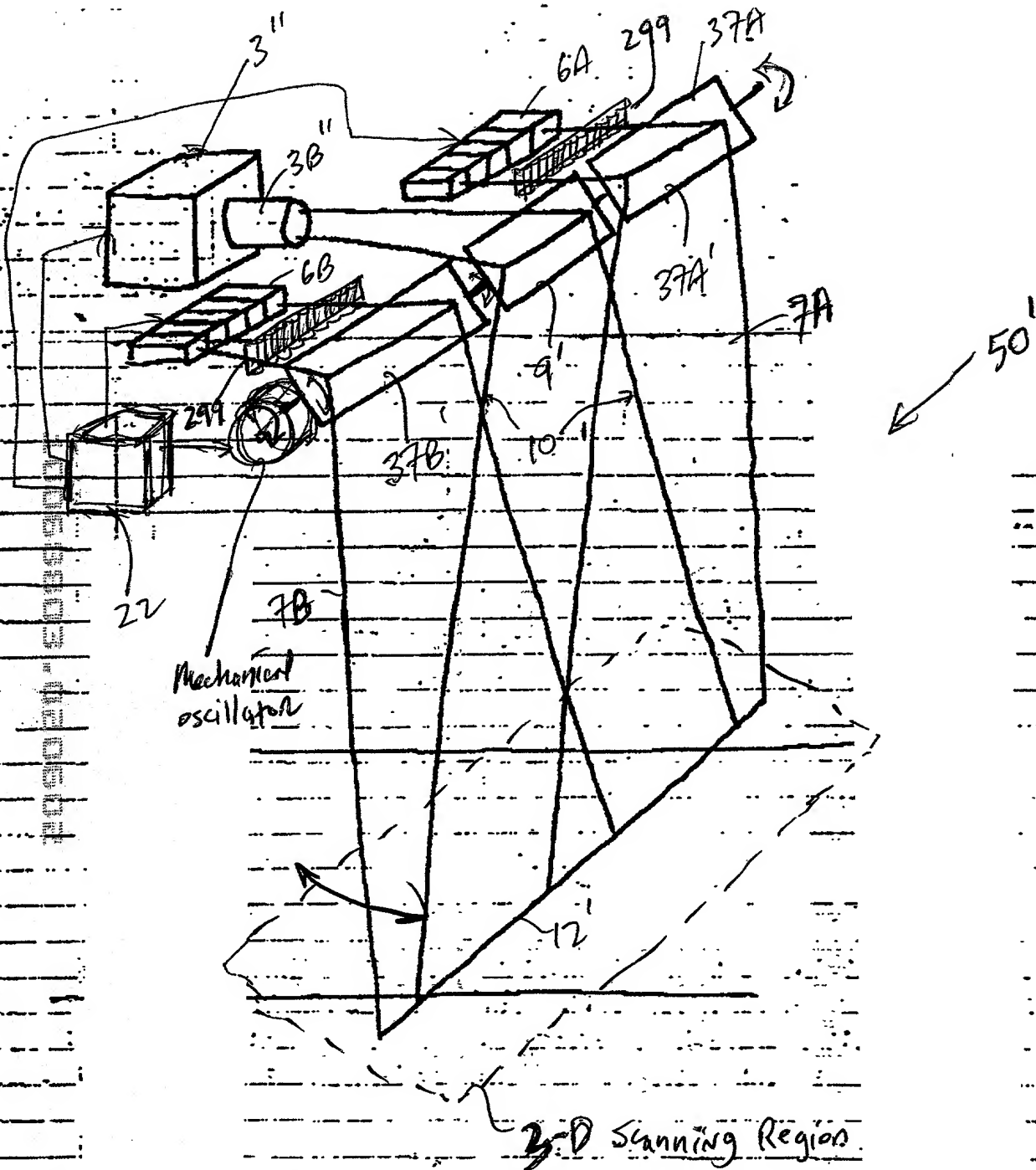
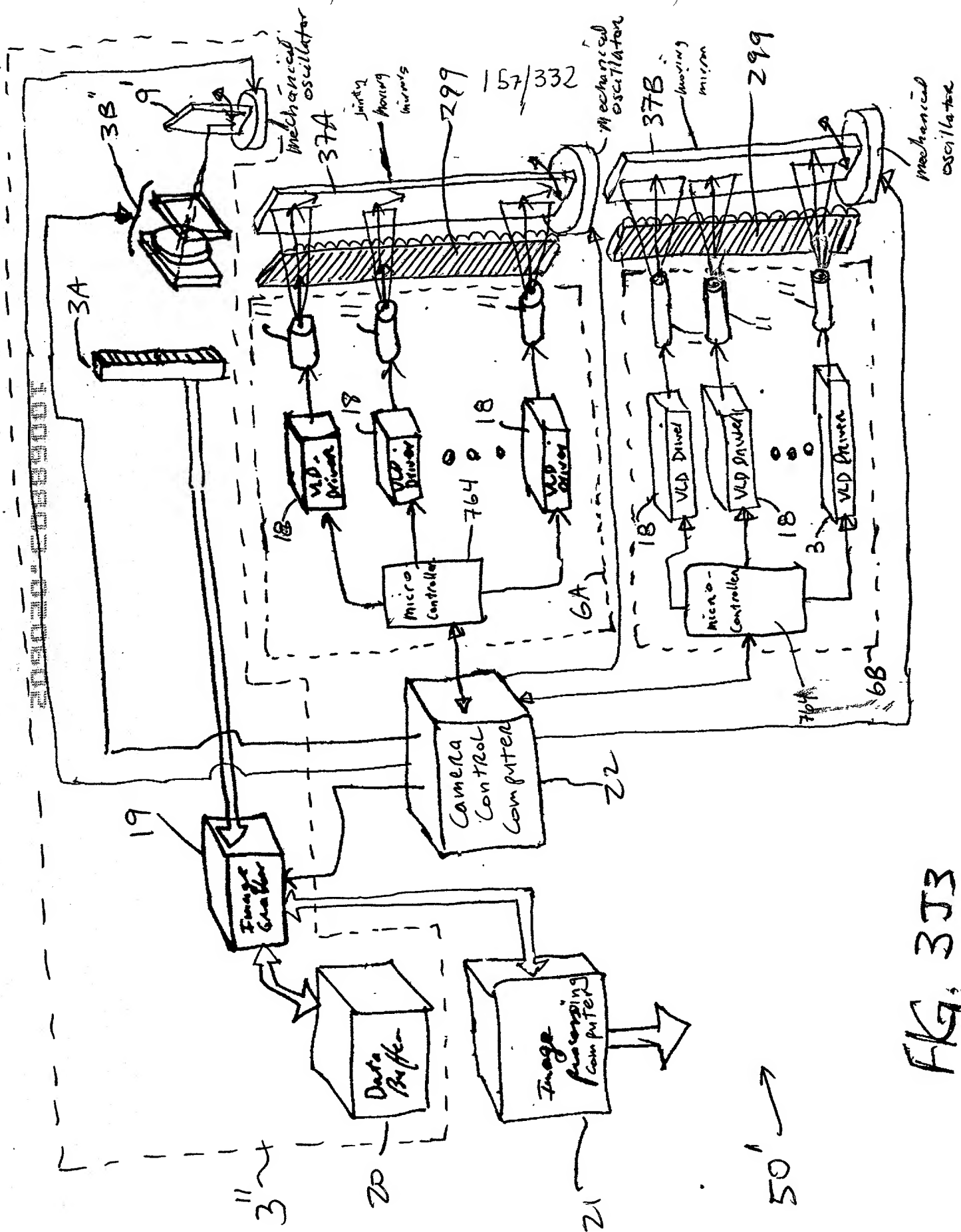


FIG 3J2



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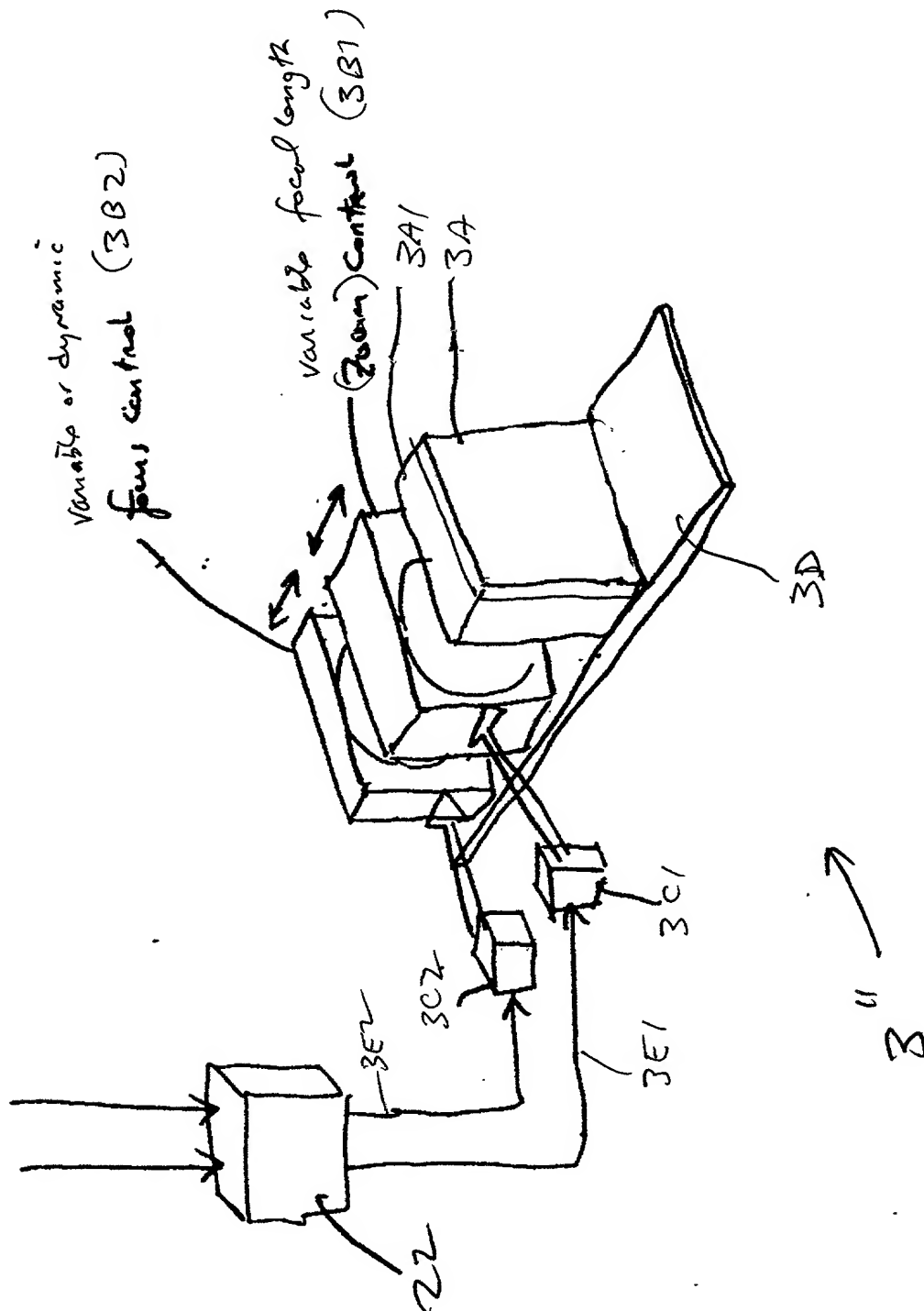
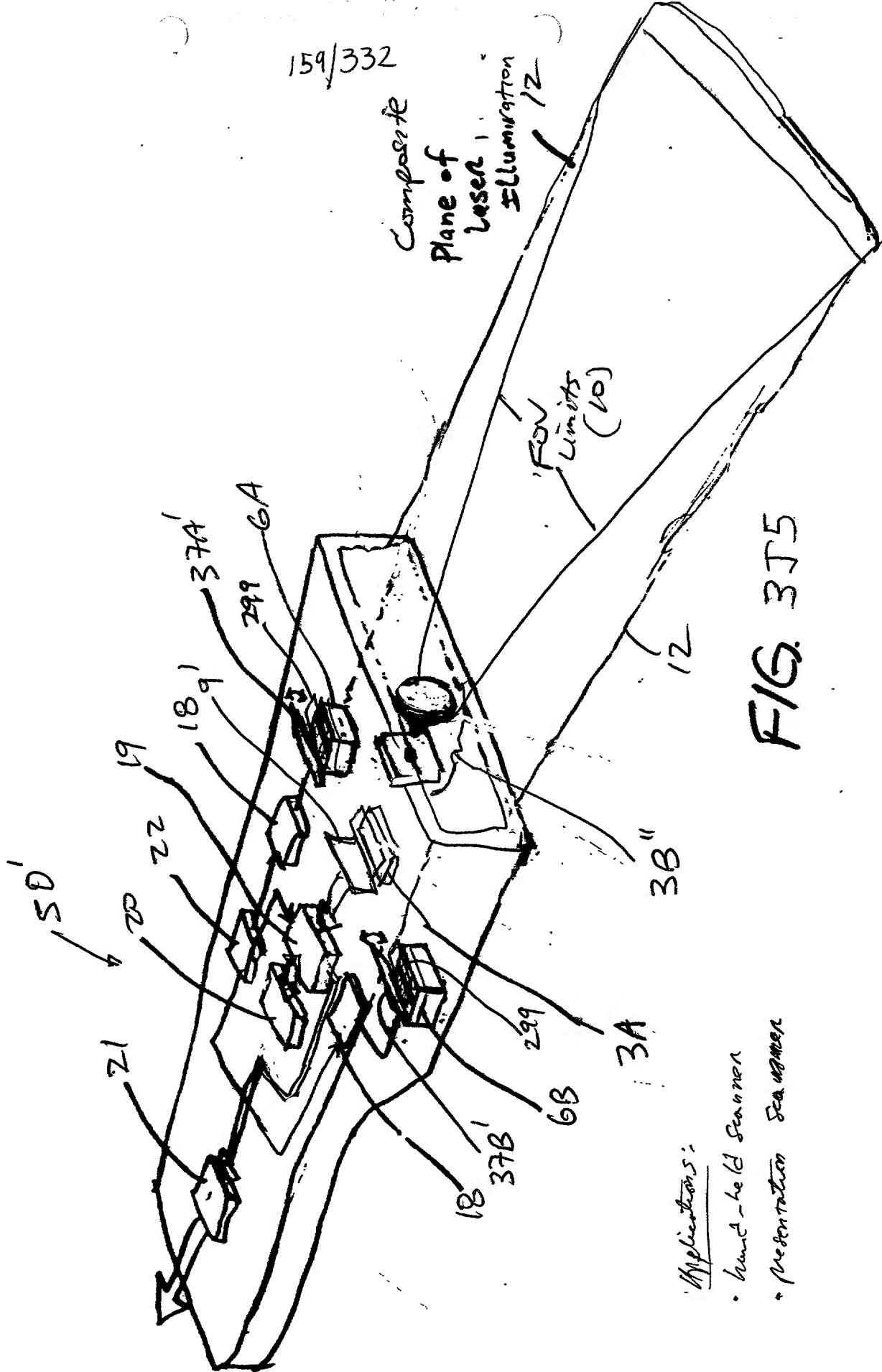


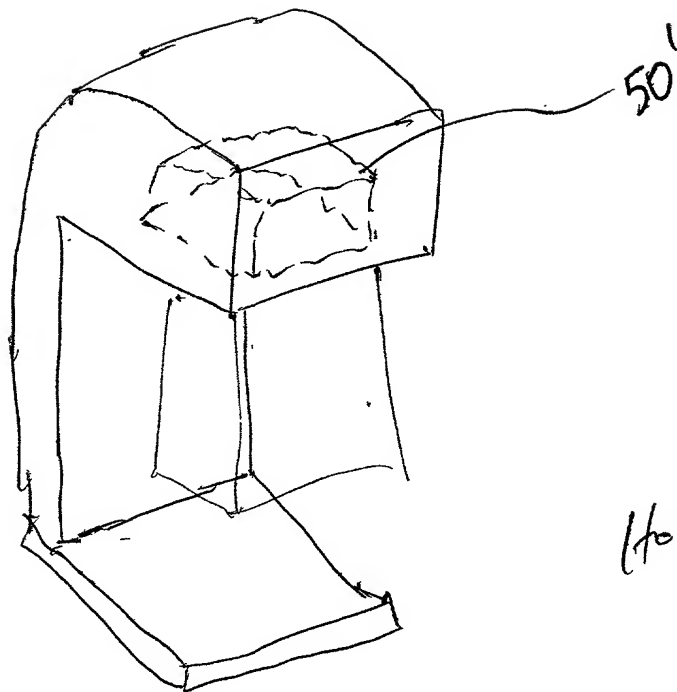
FIG. 3J4



Applications:

- Hand-held Scanner
- Presentation Scanner

10068803-020000



2-D
hold-under
scanner

FIG. 3J6

10068803-0006001

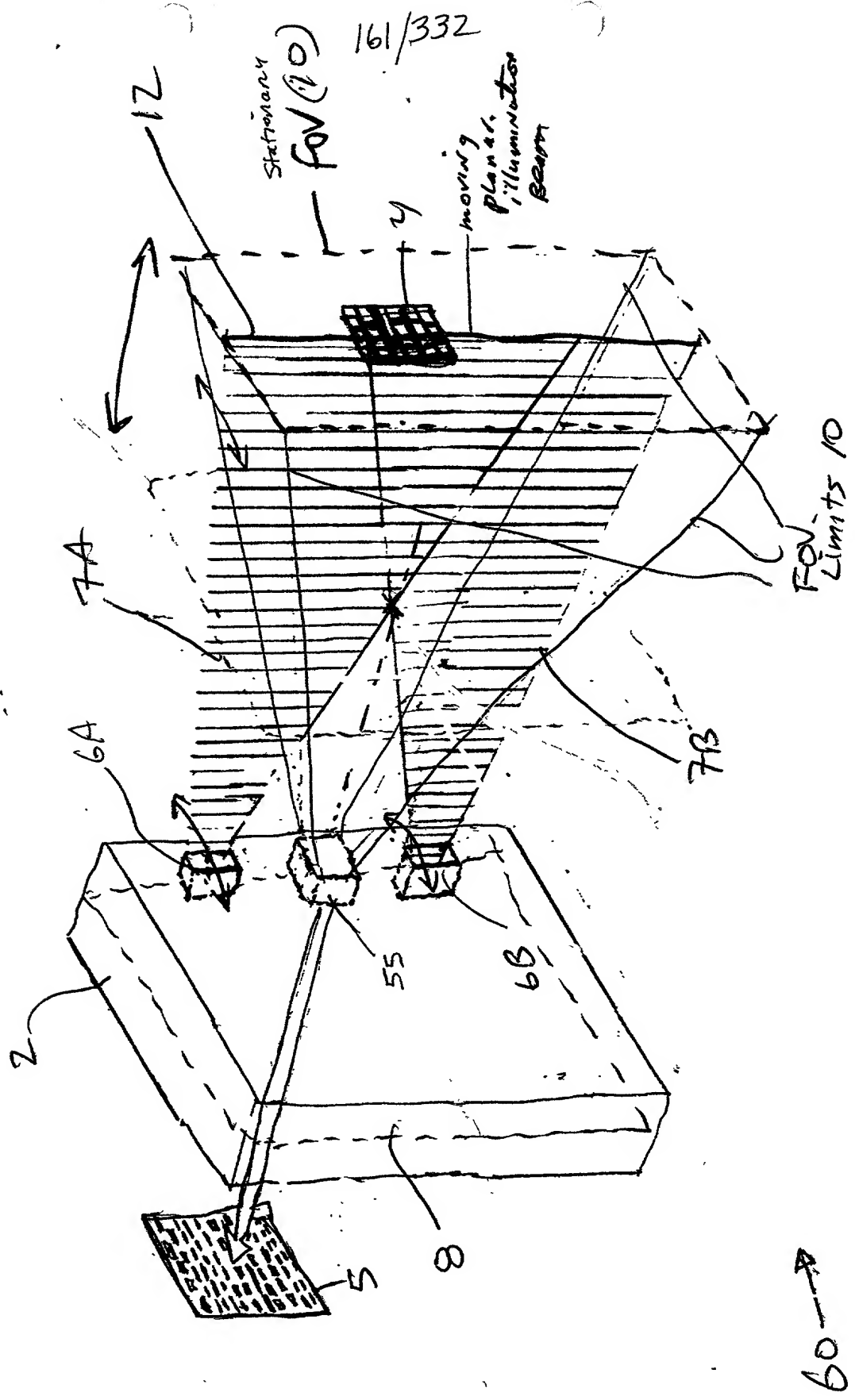
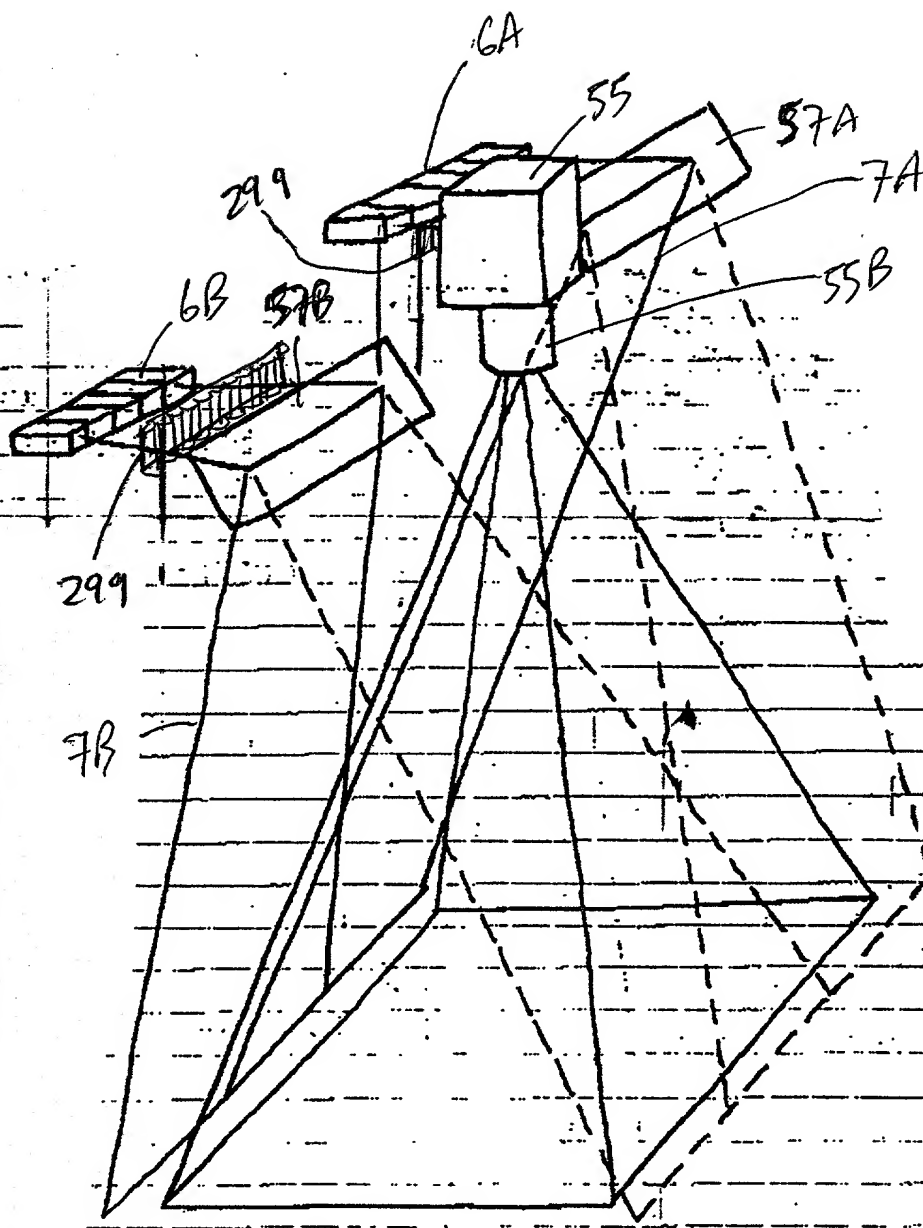


FIG 4A

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60A

FIG. 4B1

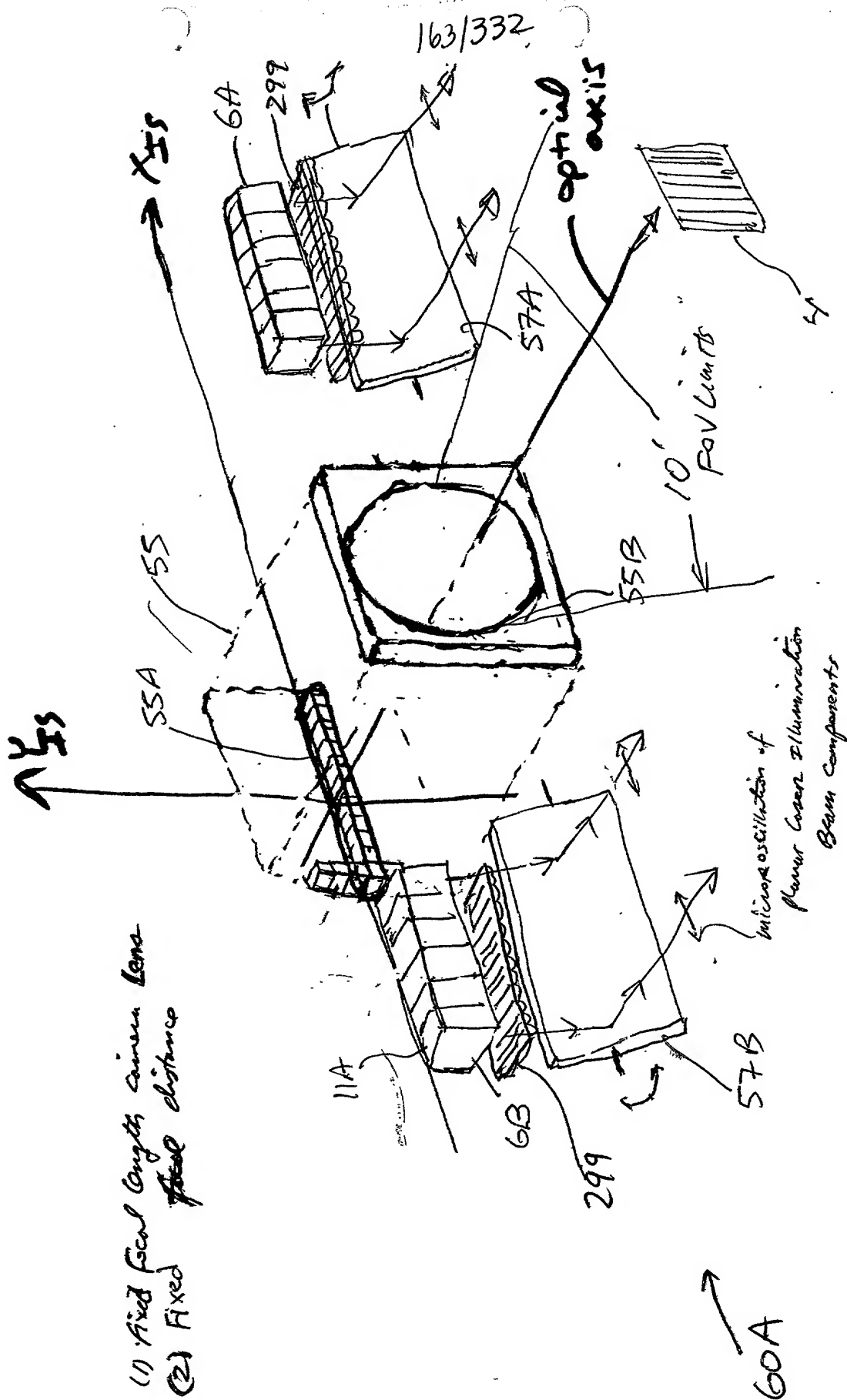


FIG. 4B Z

2099020* 00889001

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Fixed focal length
fixed focal distance

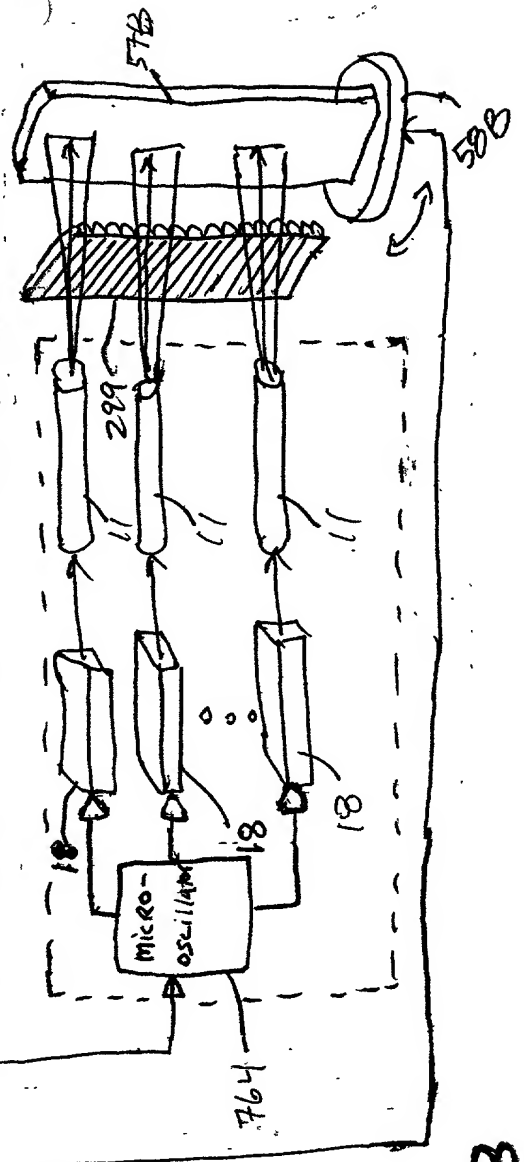
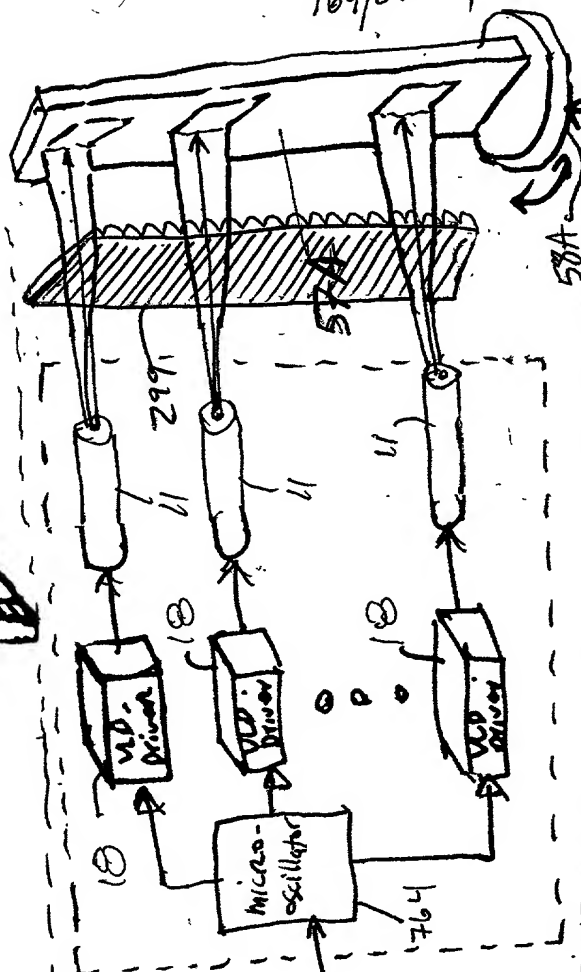
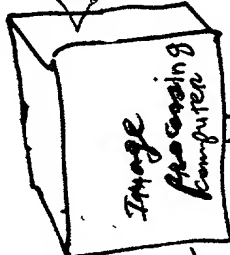
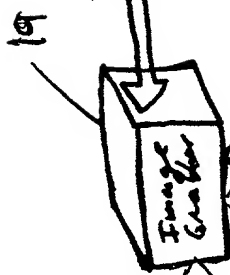
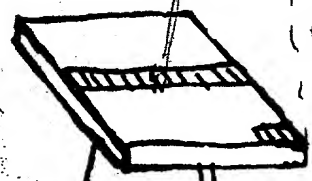


FIG. 4B3

60A

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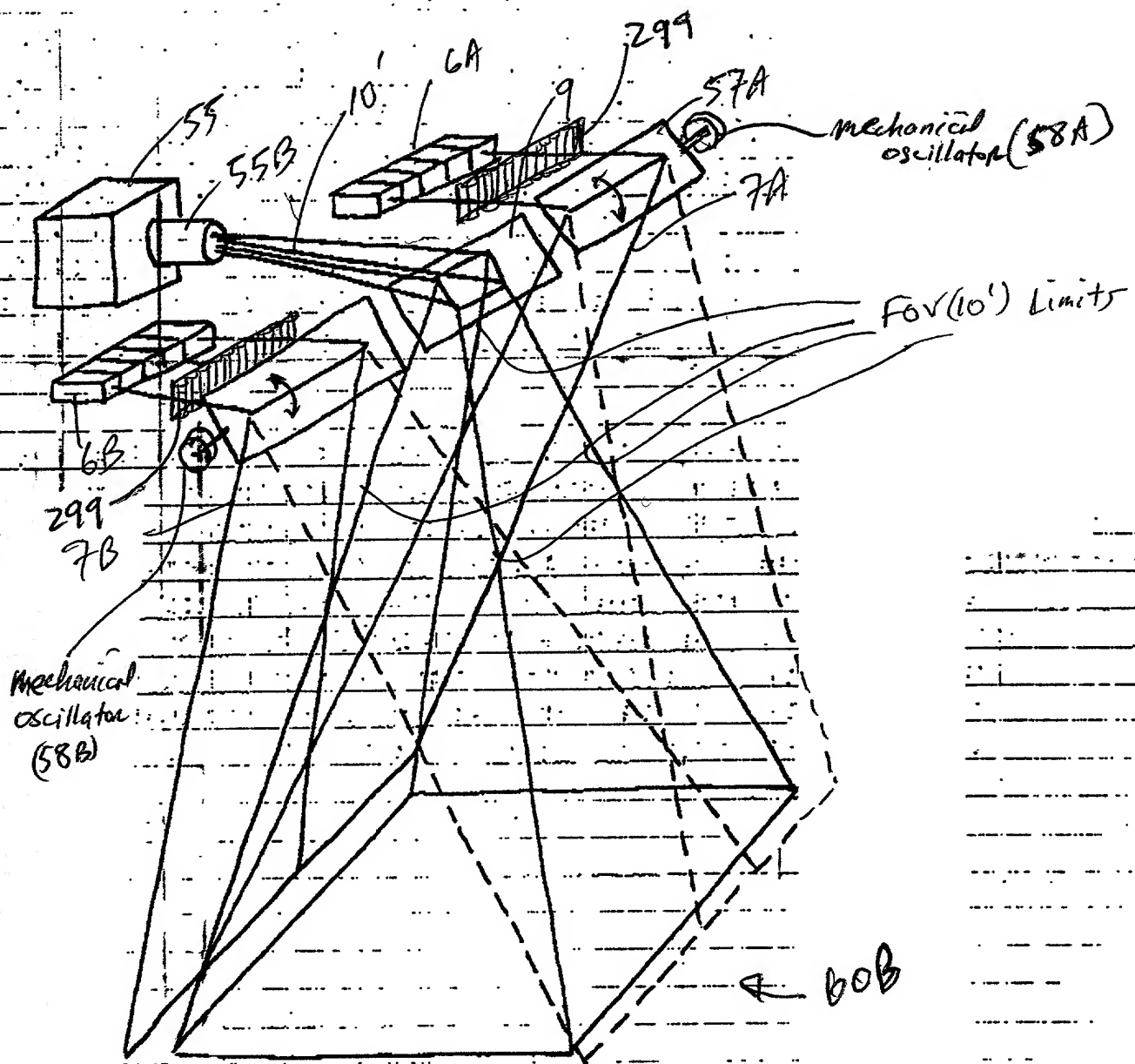


FIG. 4C1

11-11-11

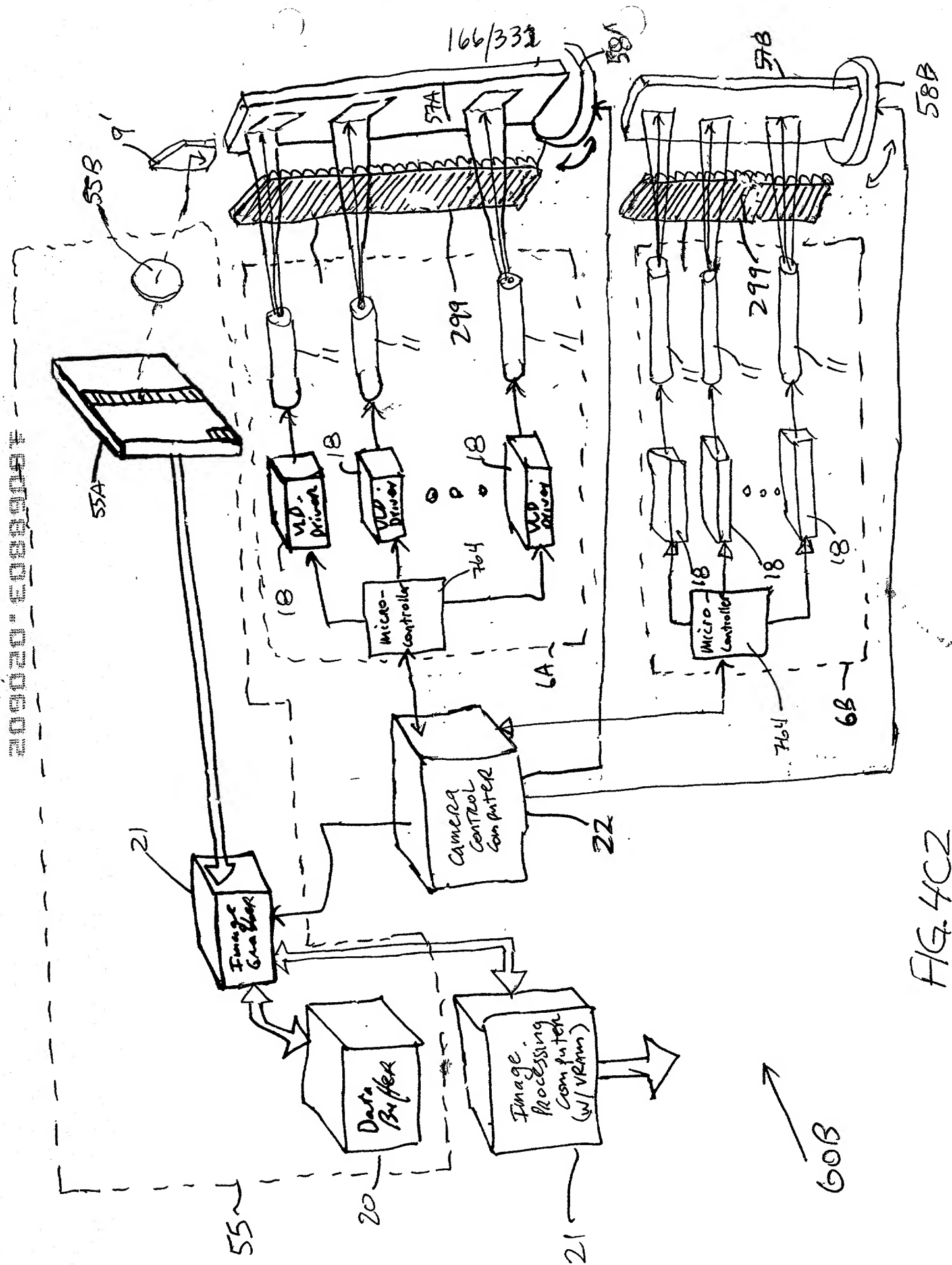


FIG. 4C2

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20060303 020602

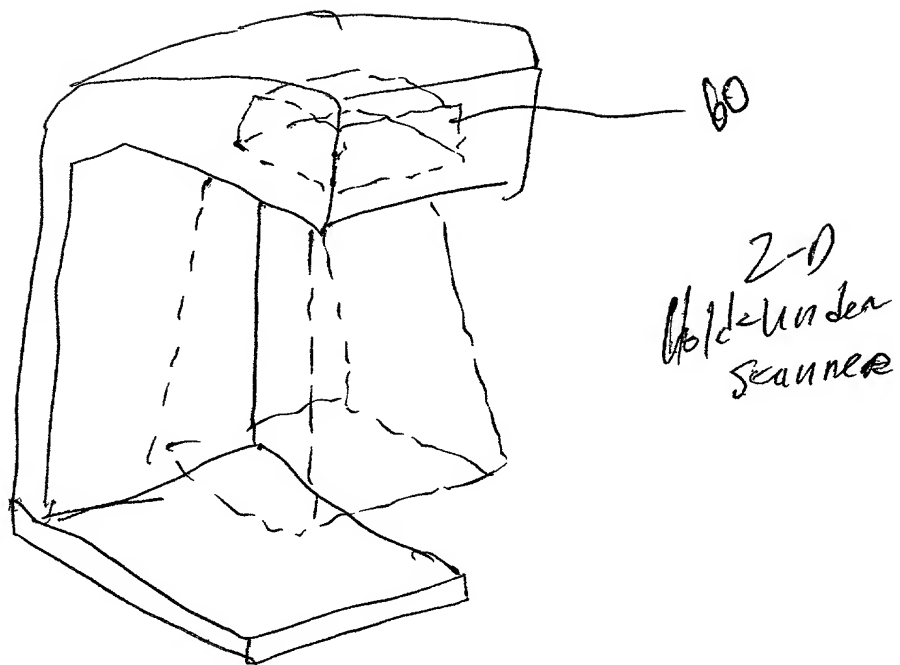


FIG. 4D

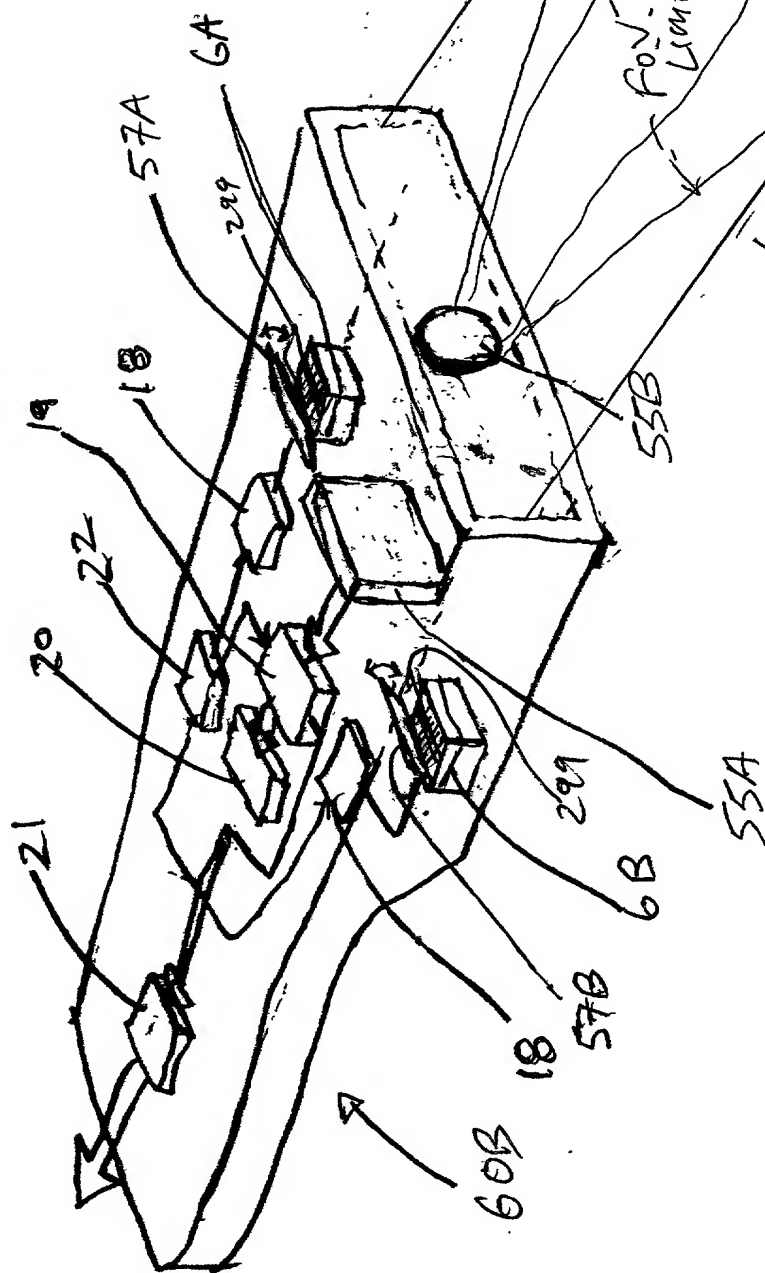


FIG. 4E

Applications:

- Hand-held Scanner
- Presentation Scanner

10068803.020602

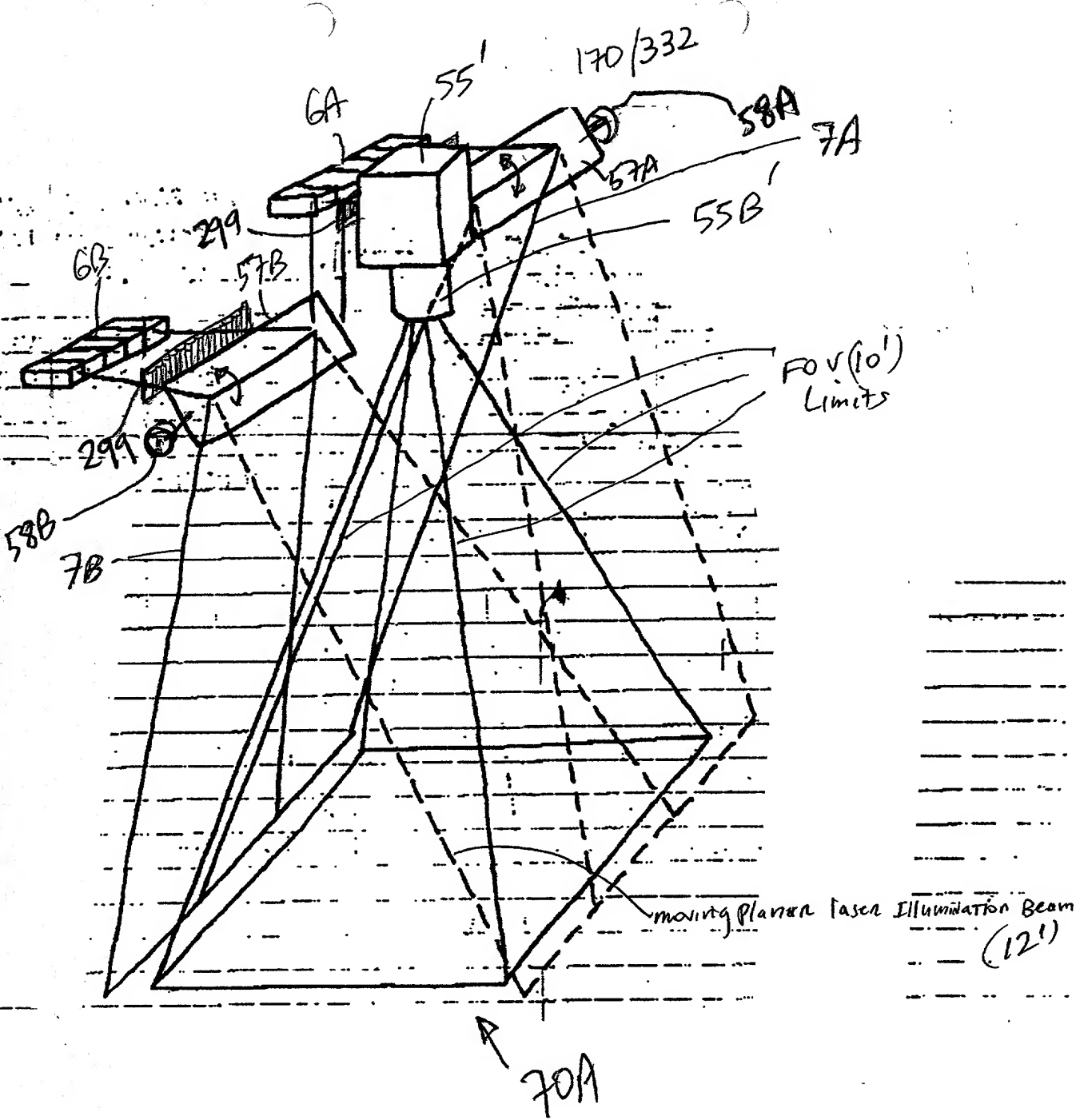


FIG 5B1

2009020" E088900T

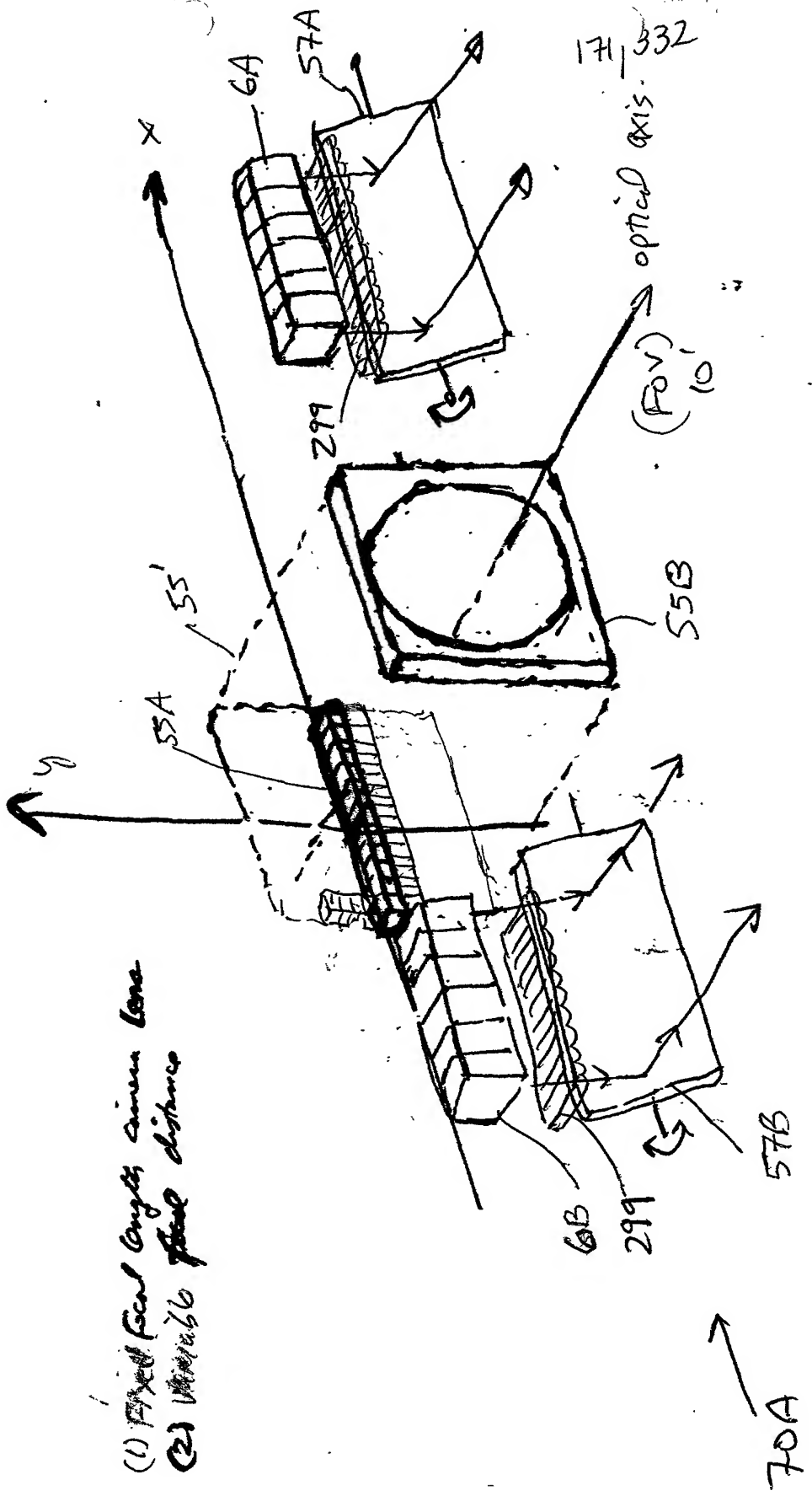


FIG. 5B2

Fig. 53

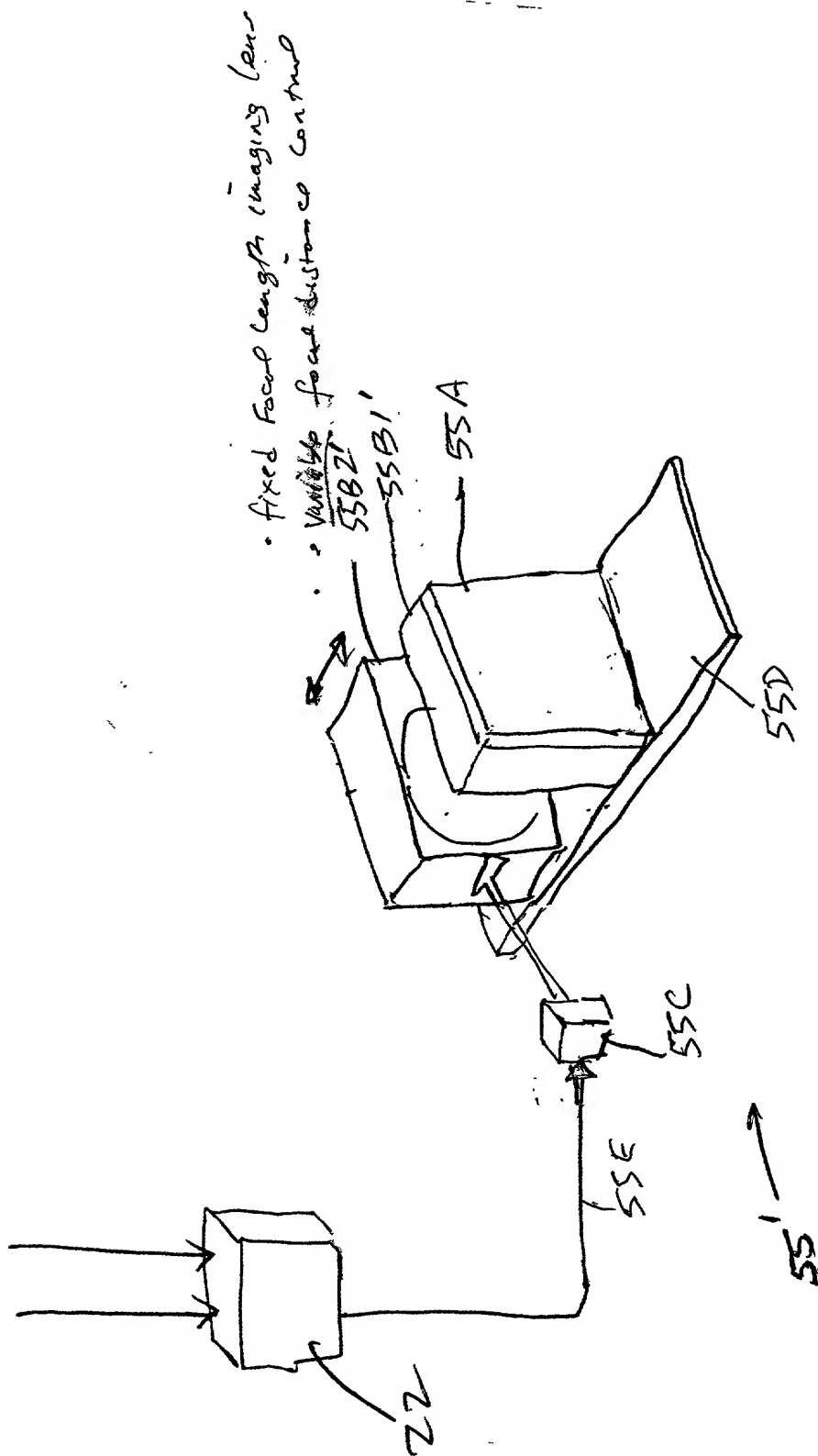


FIG. 5B4

290
582



\therefore FIG. 5C1

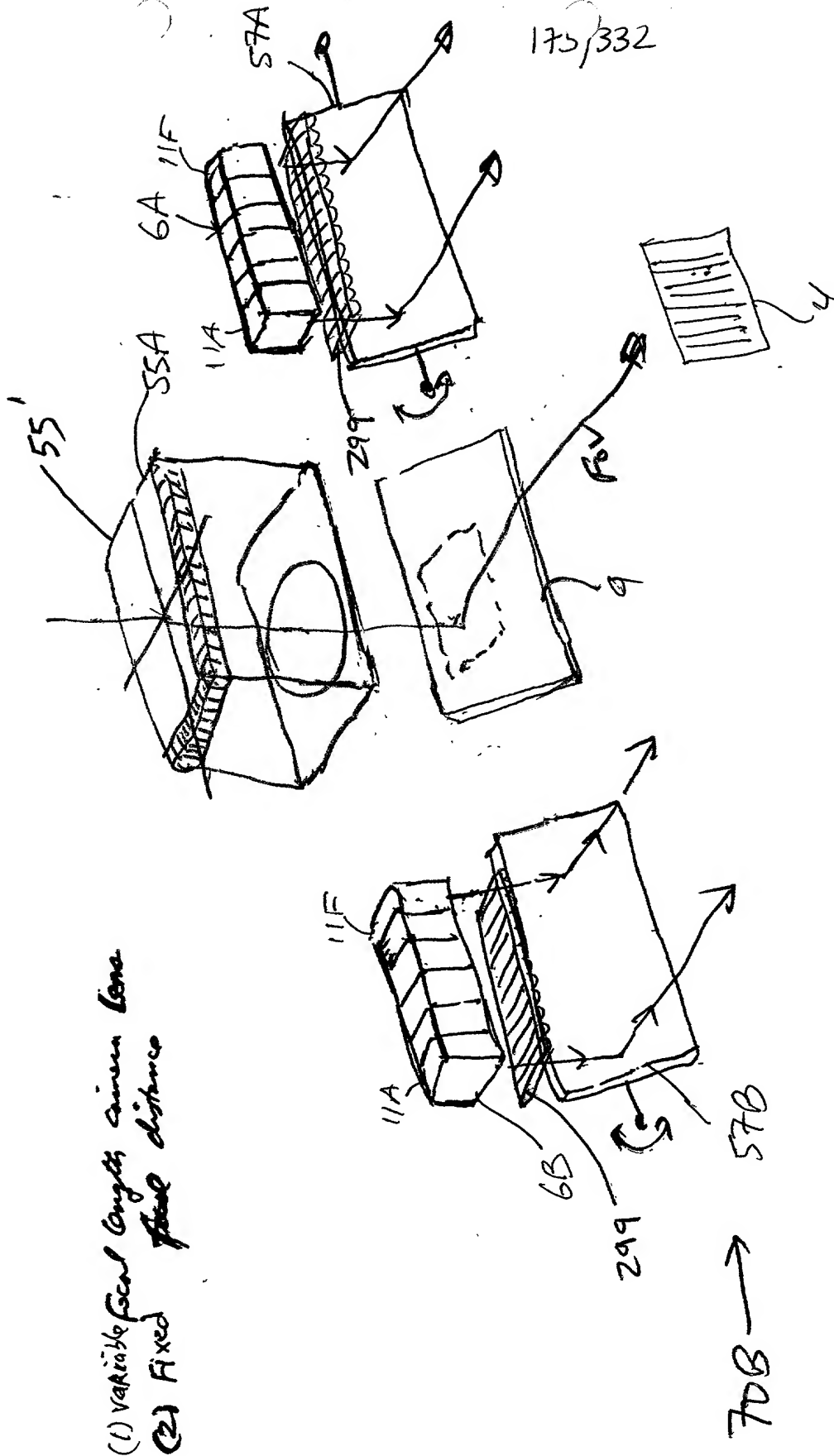


FIG. 502

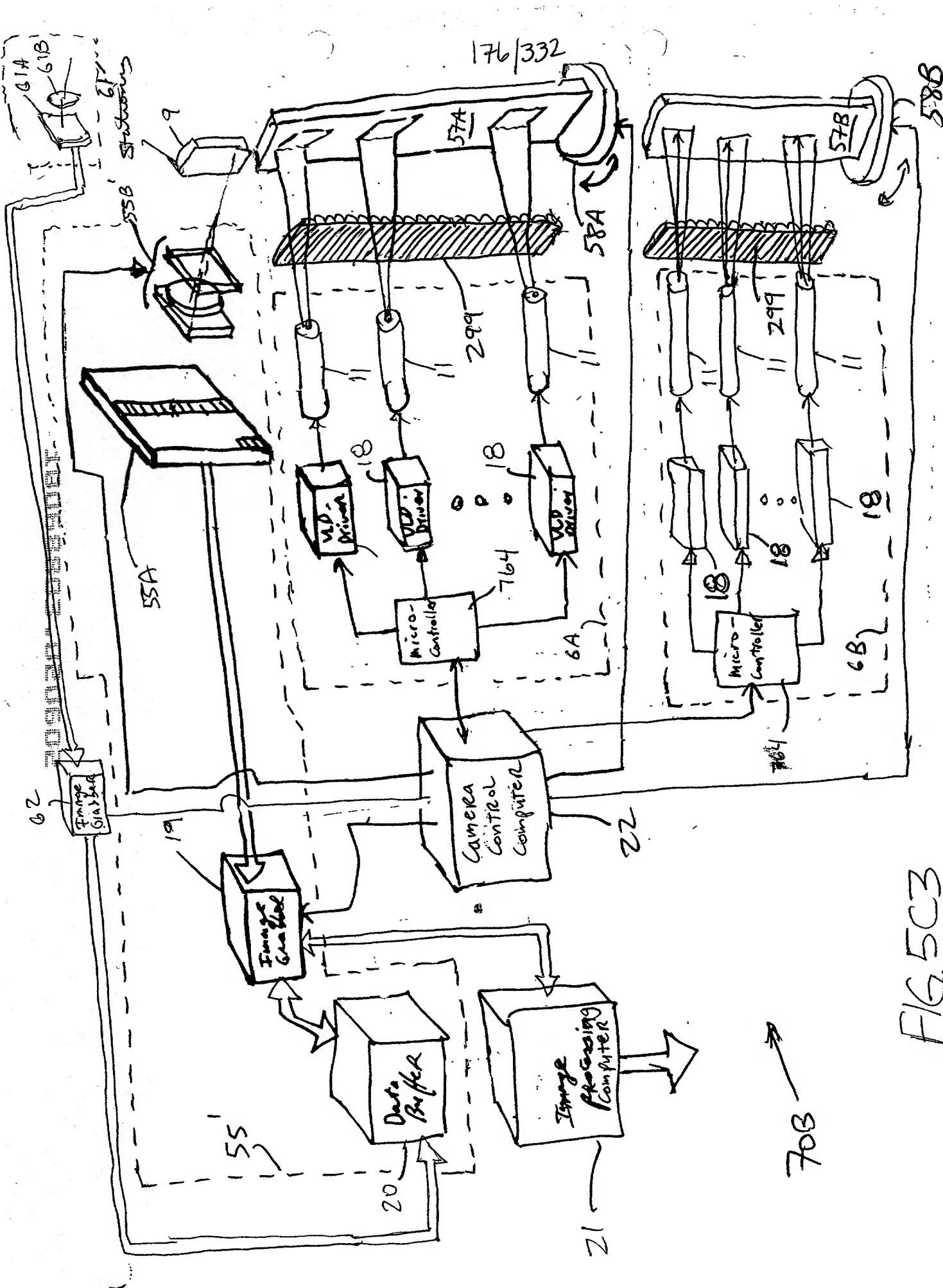


FIG. 5C3

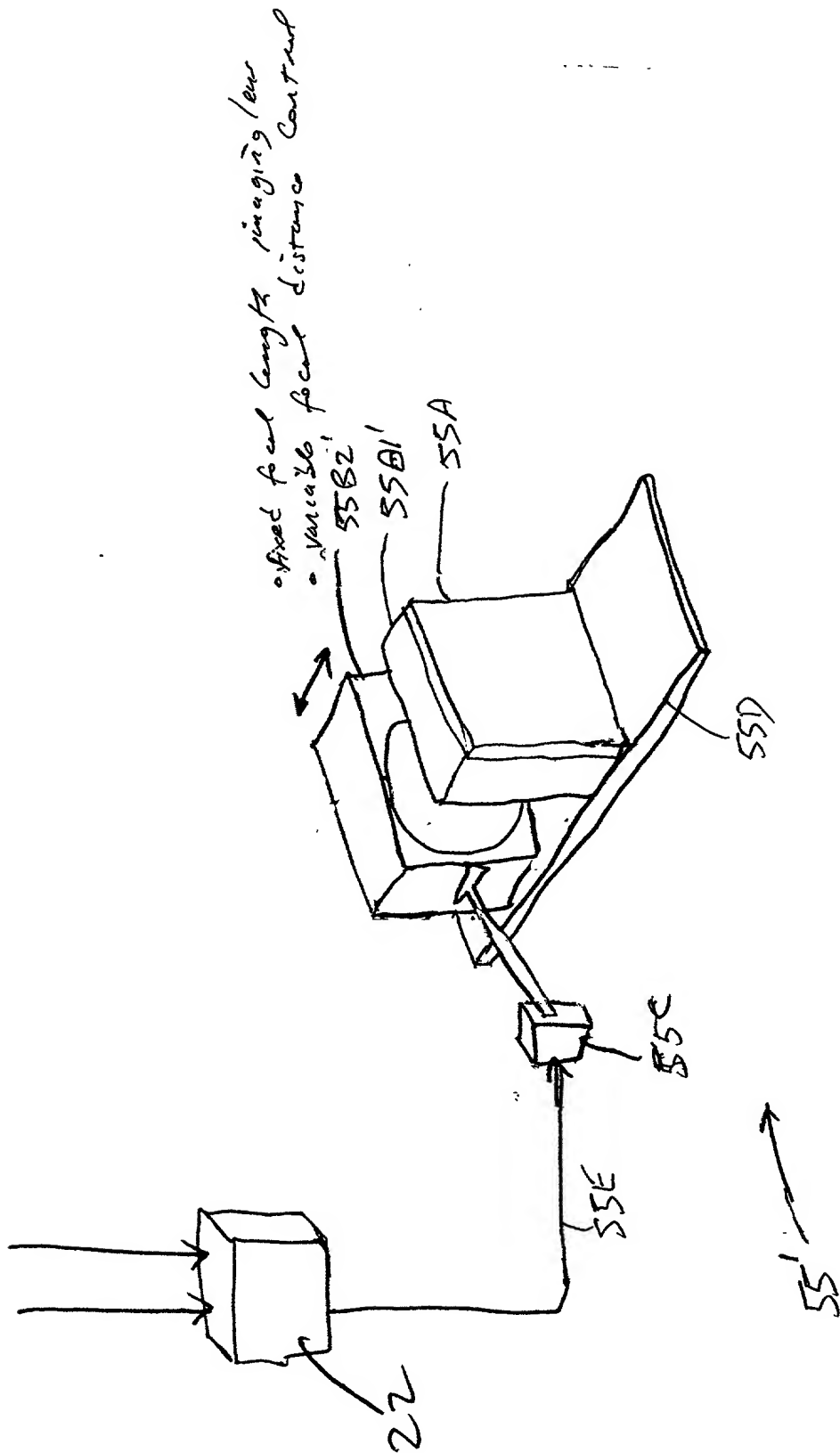


FIG. 5C4

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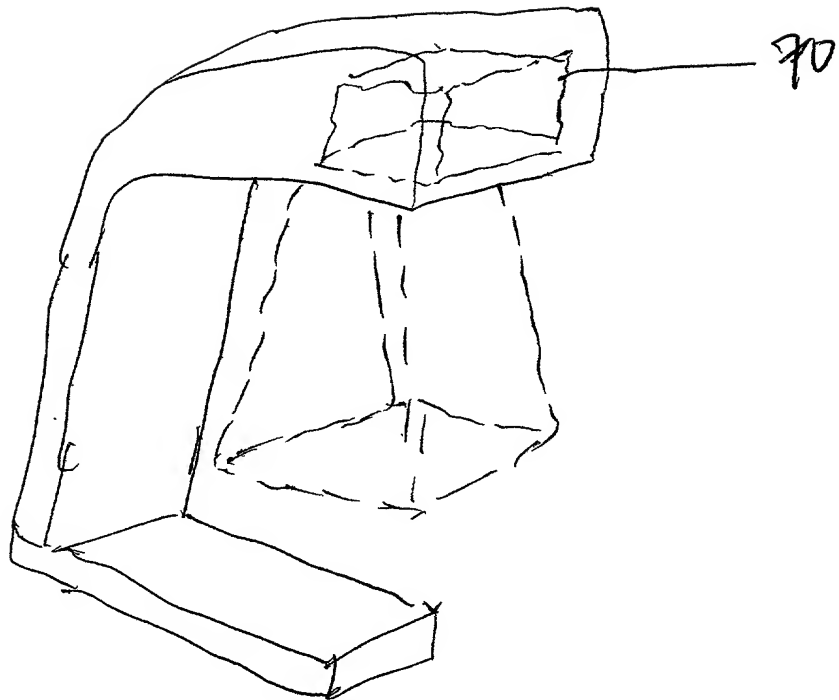


FIG 5D



Fig. 6A

20090209-020600

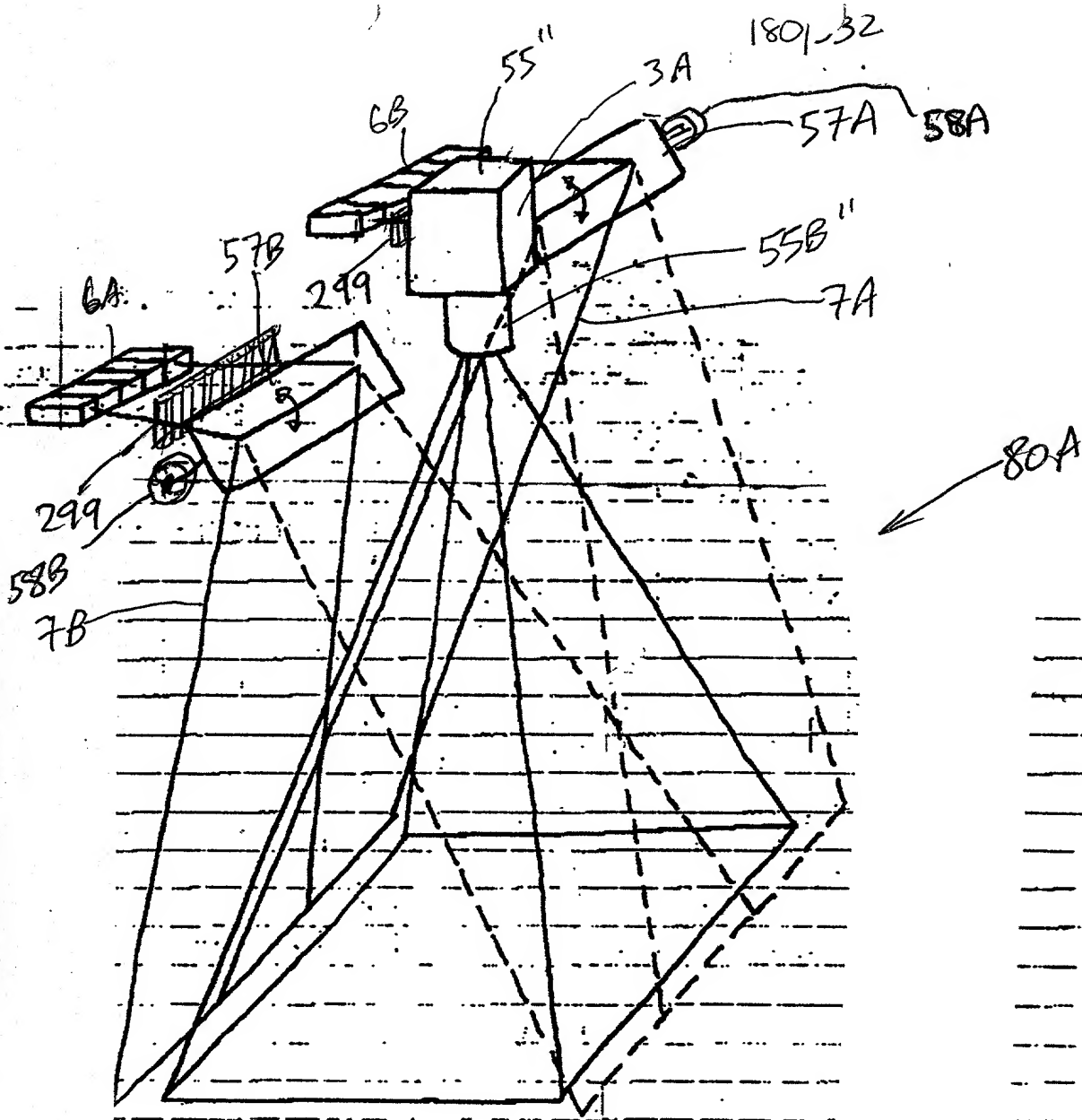


FIG. 6B1

FIG. 6B3

10066003.000602

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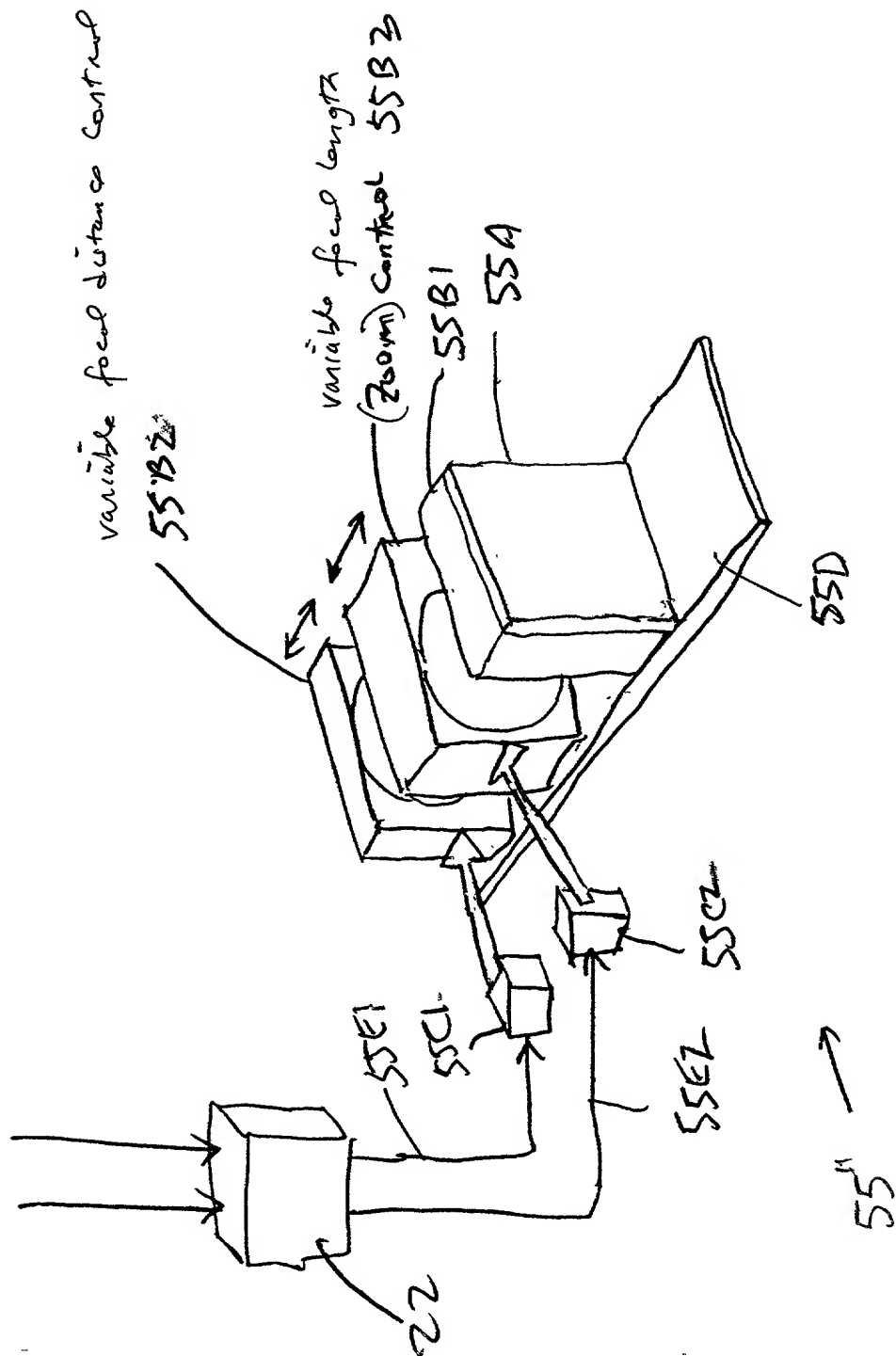


FIG. 6B4

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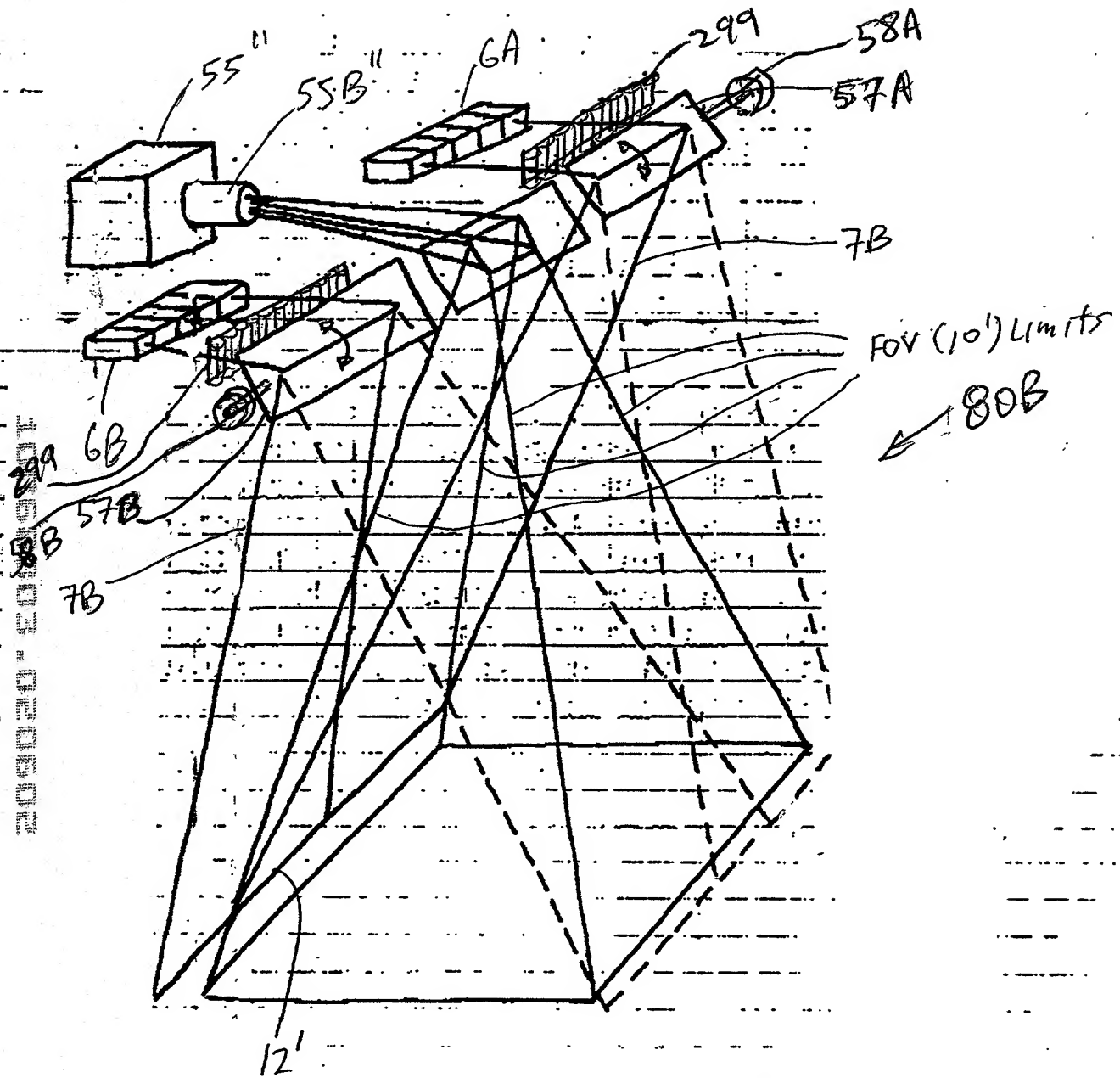
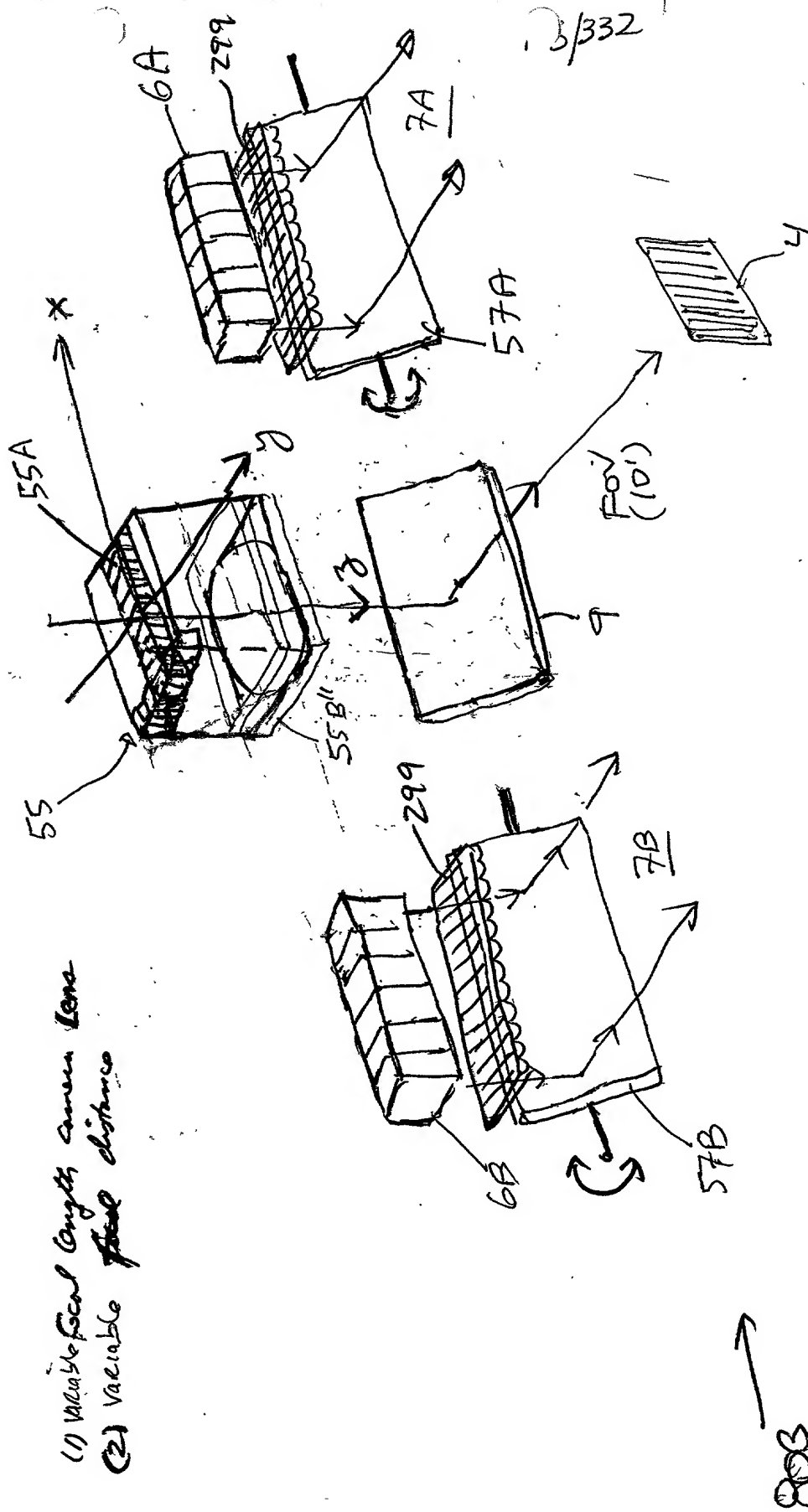


FIG. 6C1



- (1) Variable focal length camera lens
(2) Variable ~~fixed~~ distance

FIG. 6C2

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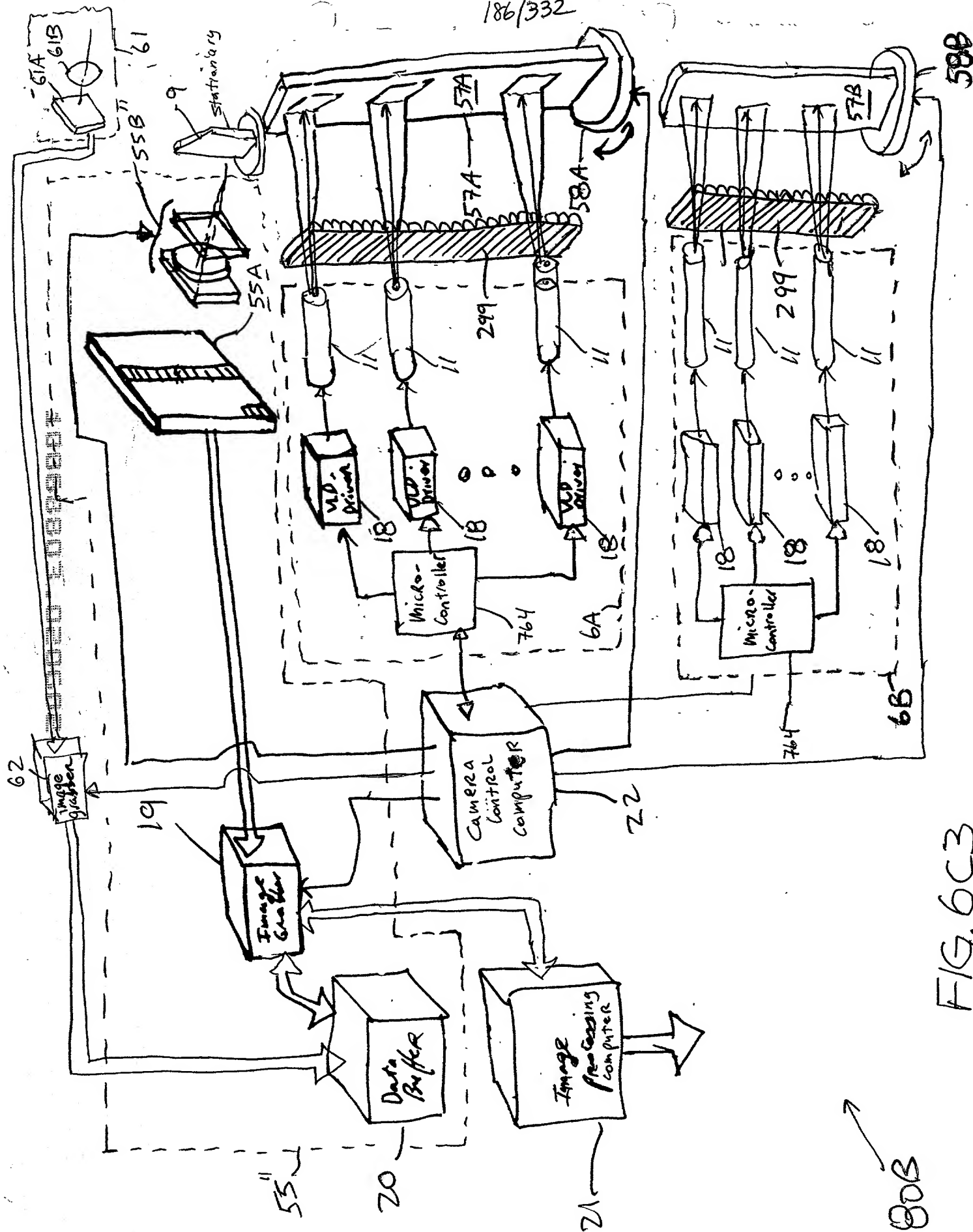


FIG. 6C3

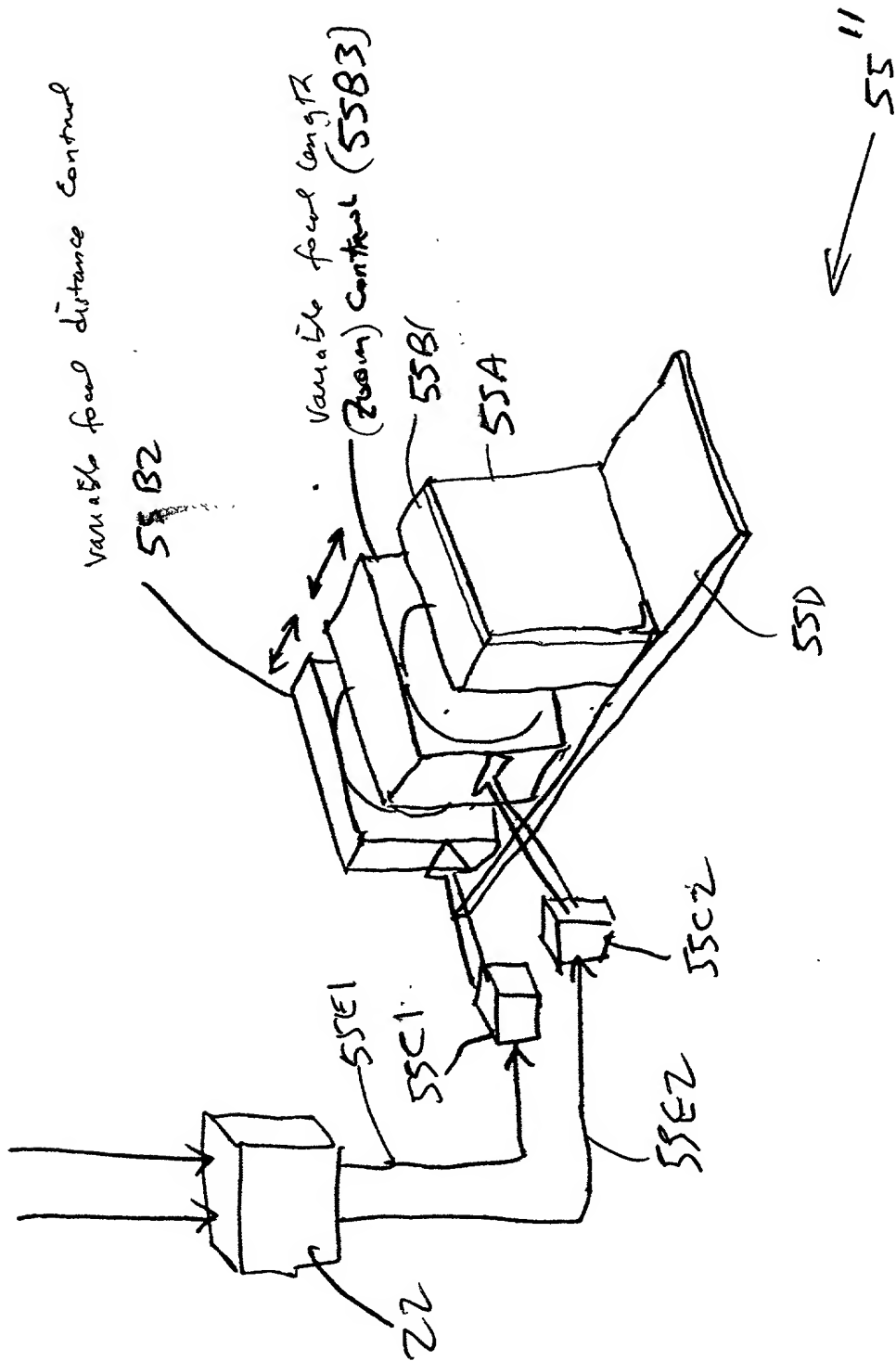


FIG. 6C4

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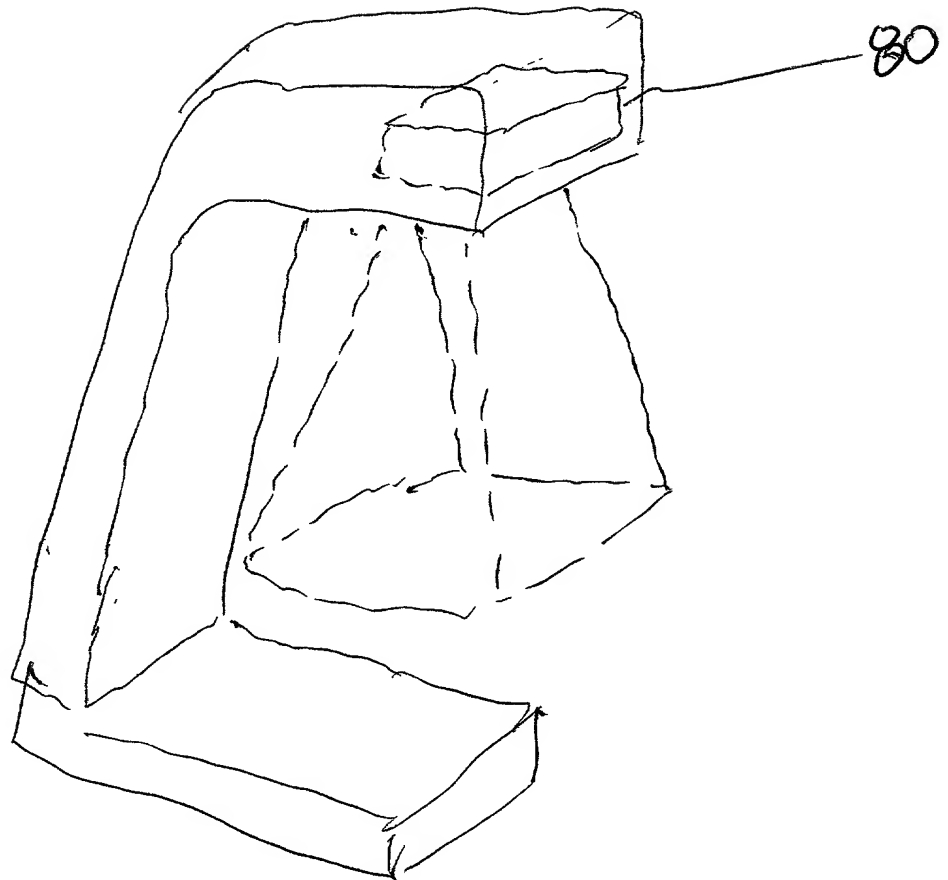


FIG. 6C5

10068803-020602

THE UNIVERSITY OF CHICAGO

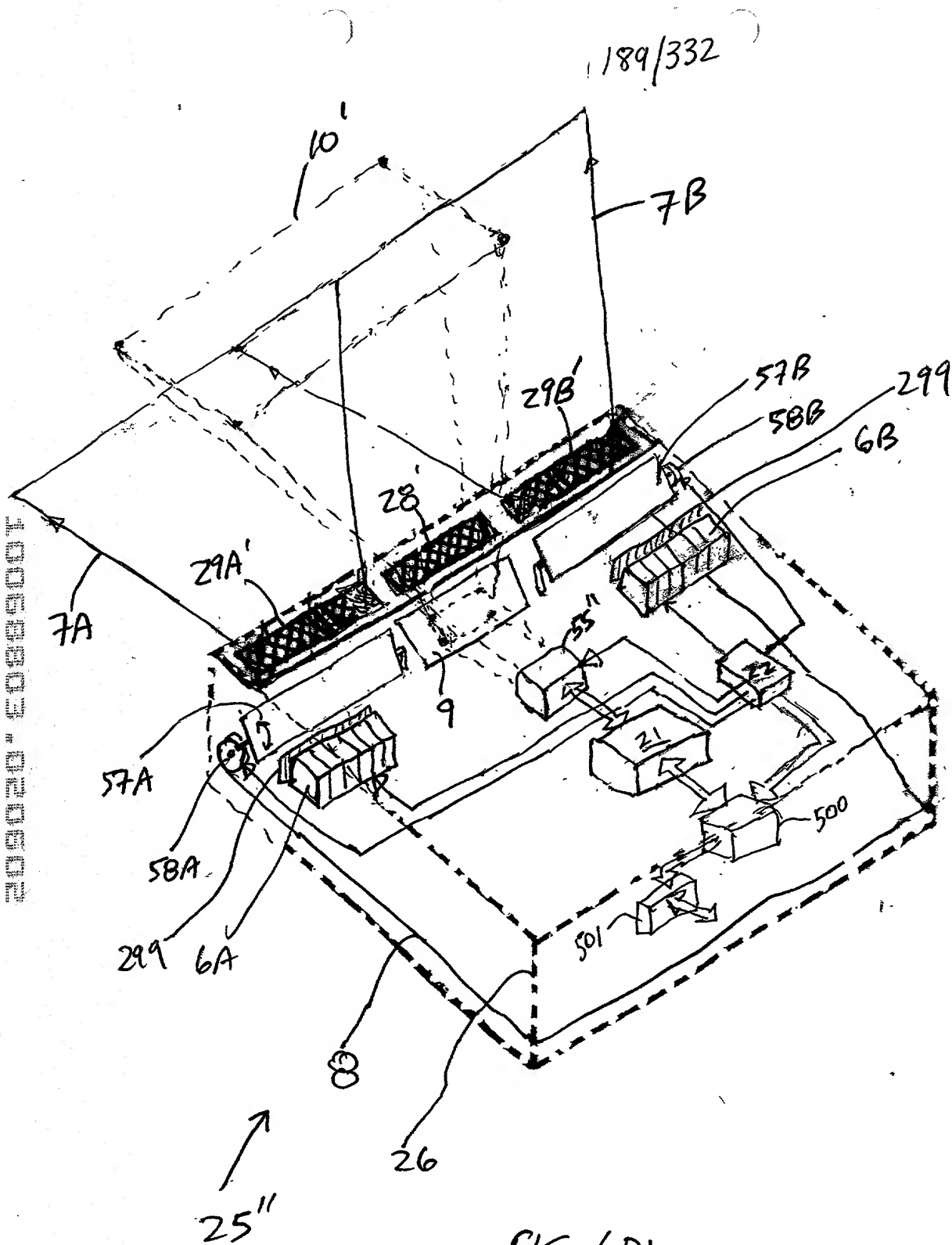


FIG. 6D1

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10068803, 020602

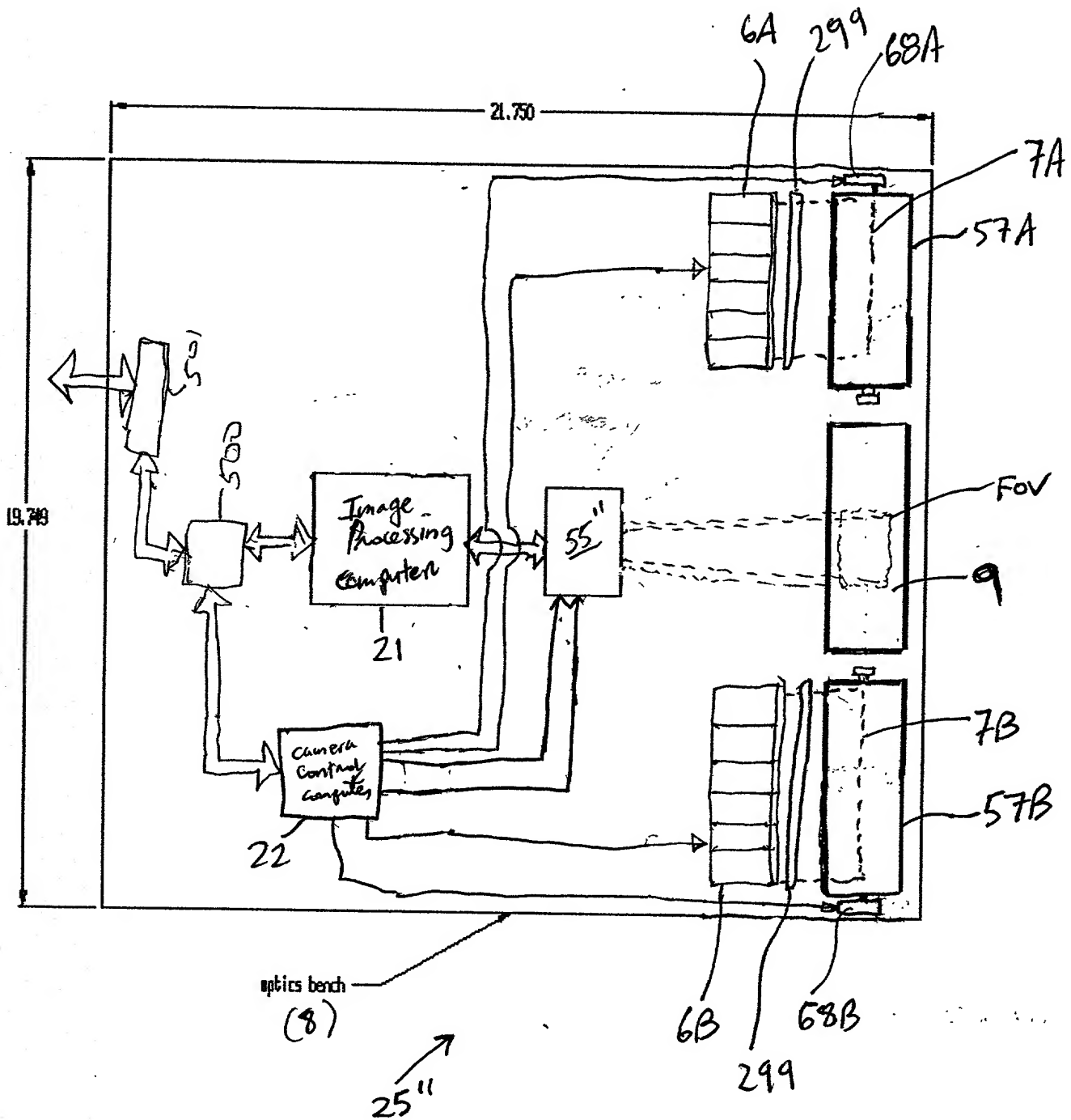
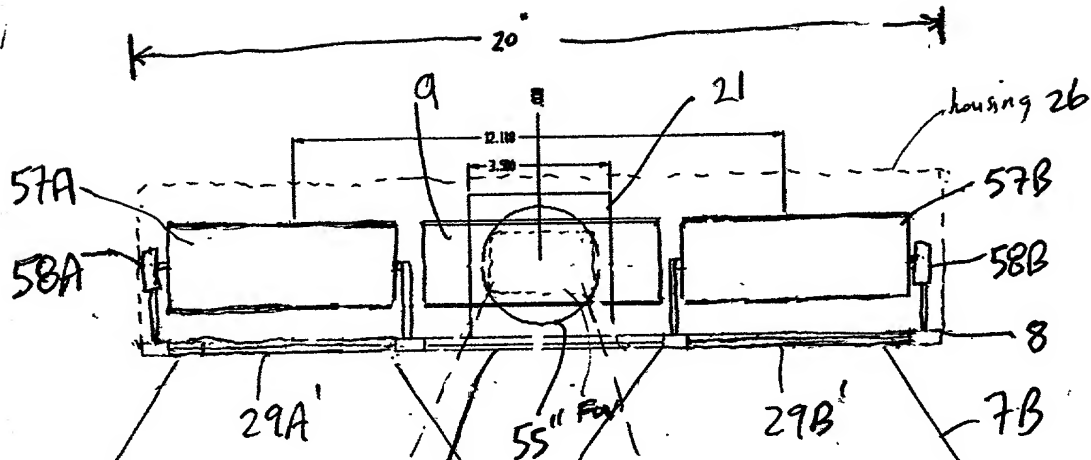


FIG. 6DZ

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29A'

29B'

7A

7B

28'

10"

Stationary
3-D
FOV

FIG. 6D3

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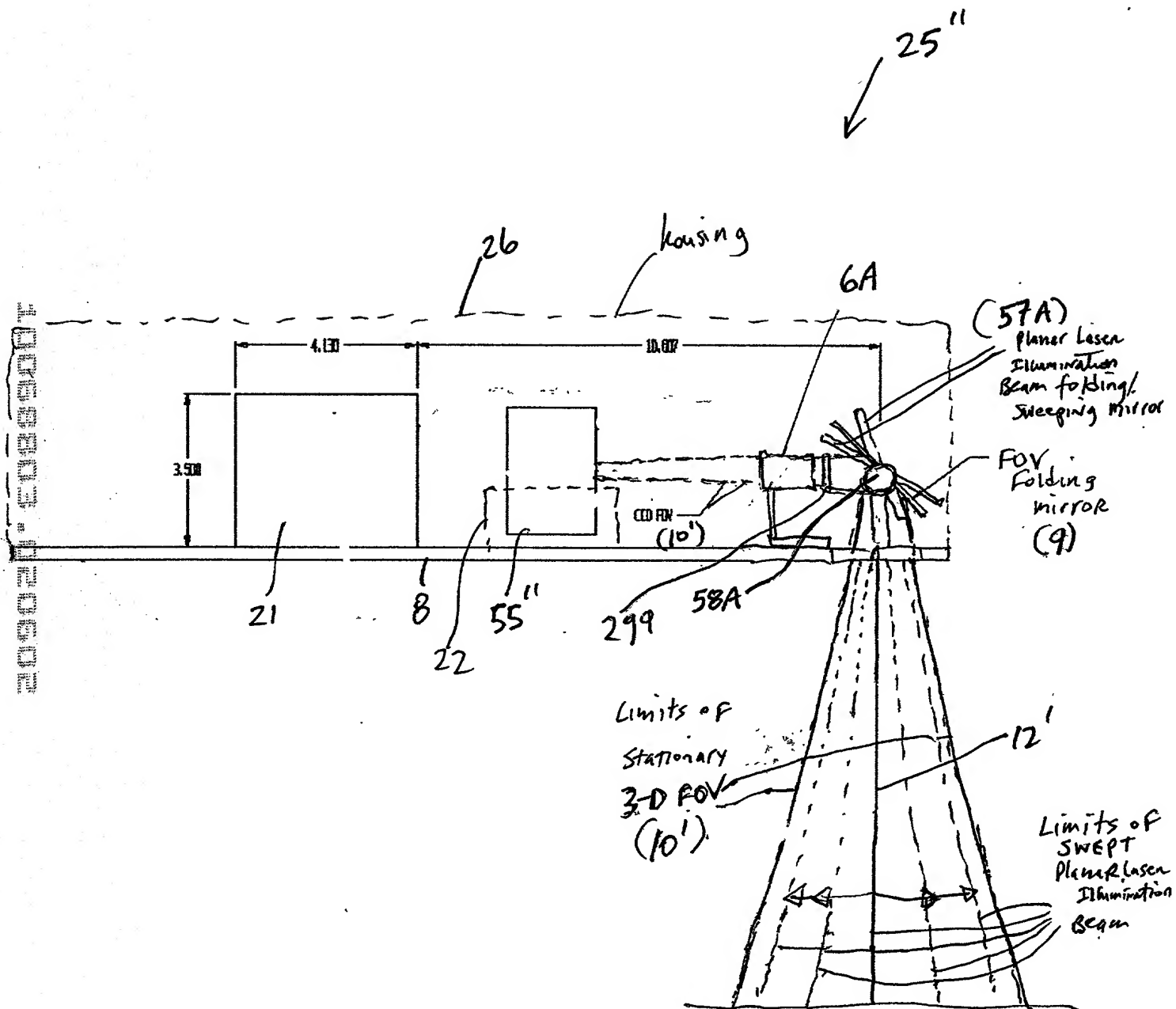


FIG. 6D4

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variable FOV

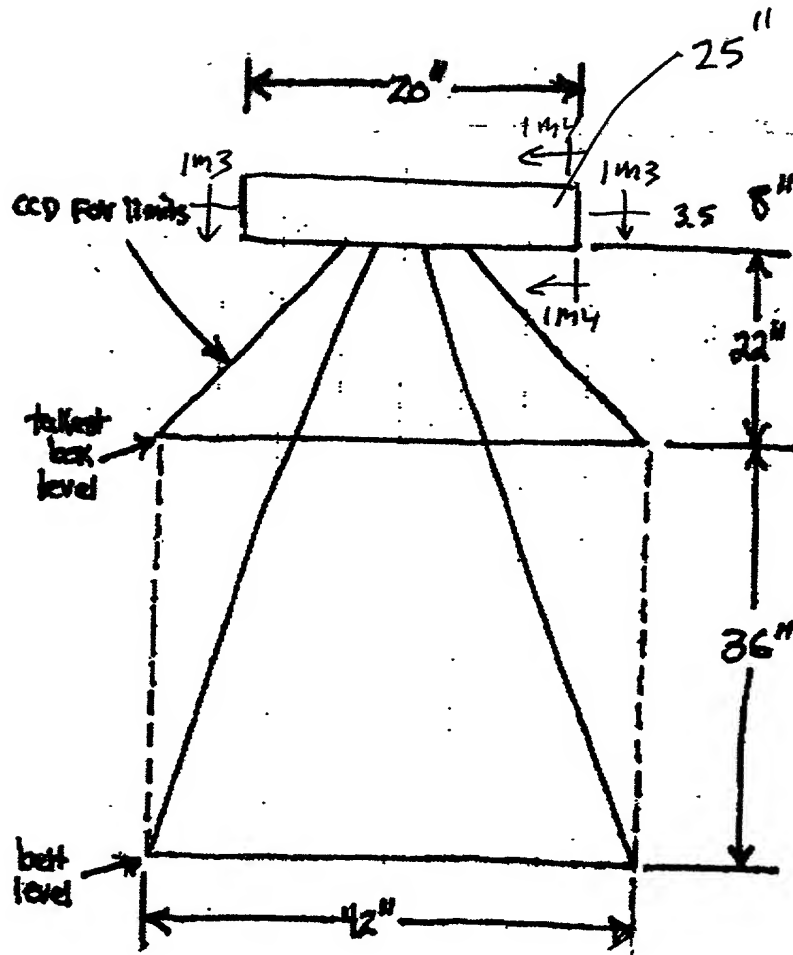


FIG. 6D5

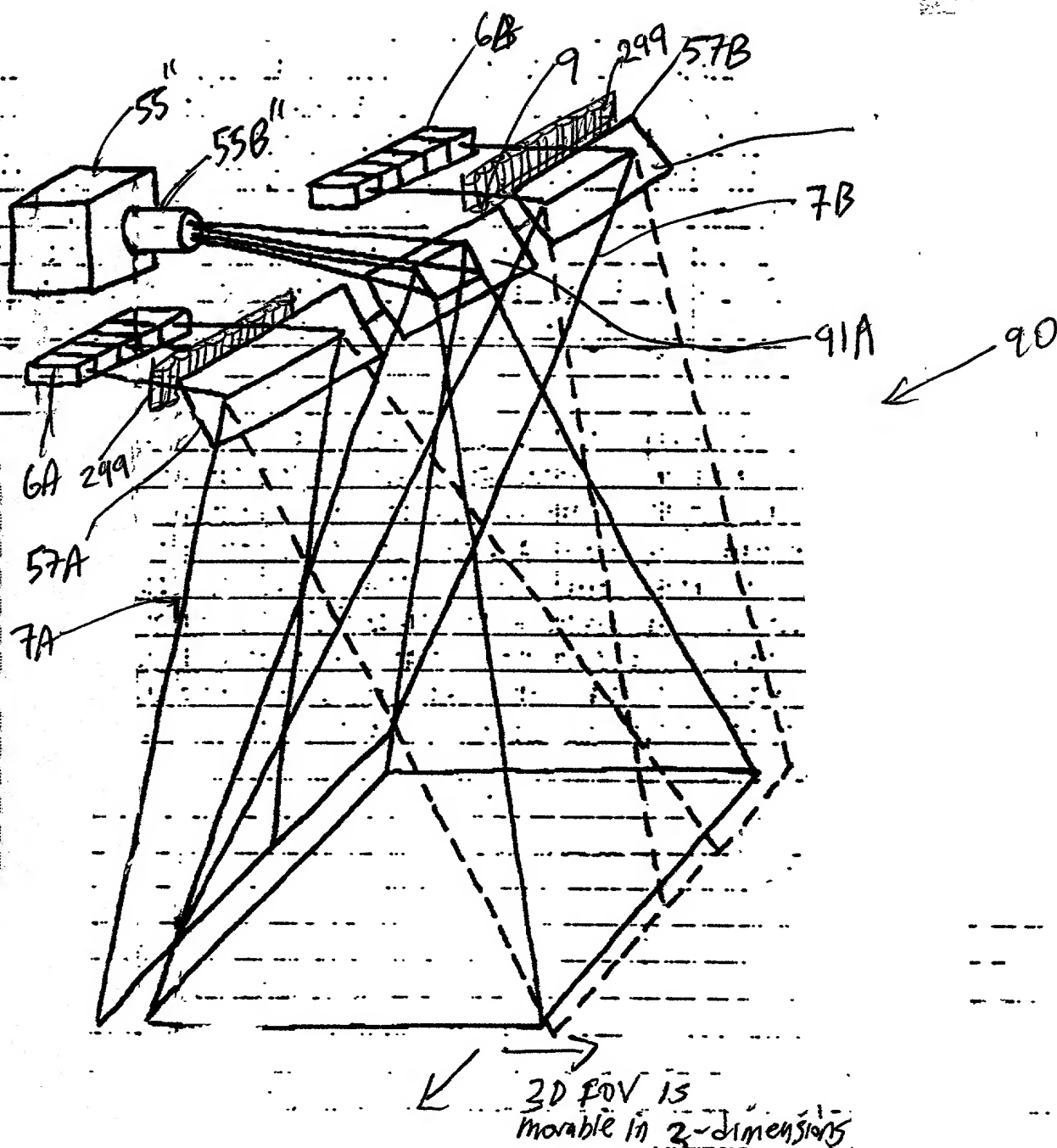
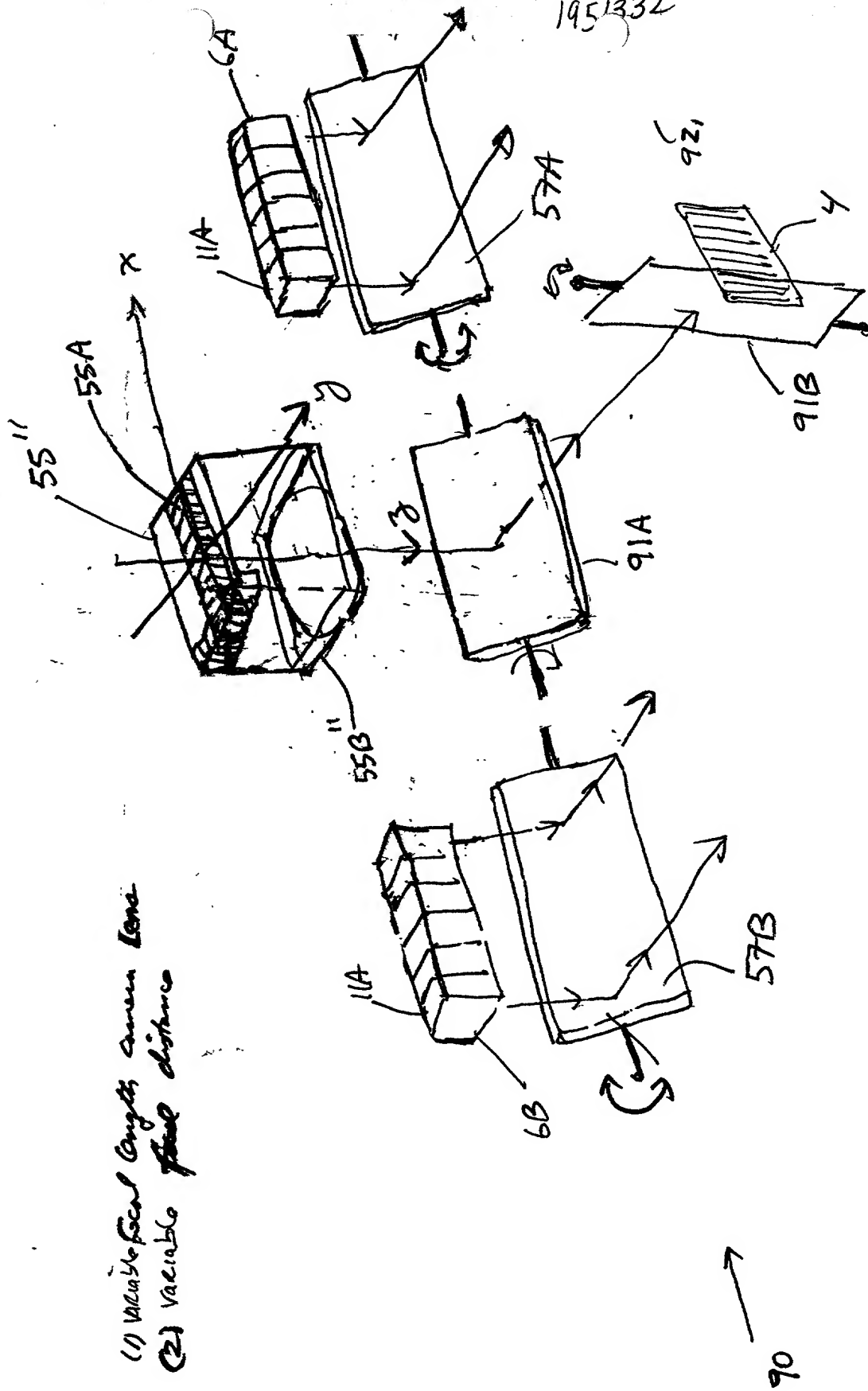


FIG. 6E1

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- (1) Variable focal length lens
- (2) Variable focal distance

FIG. 6E2

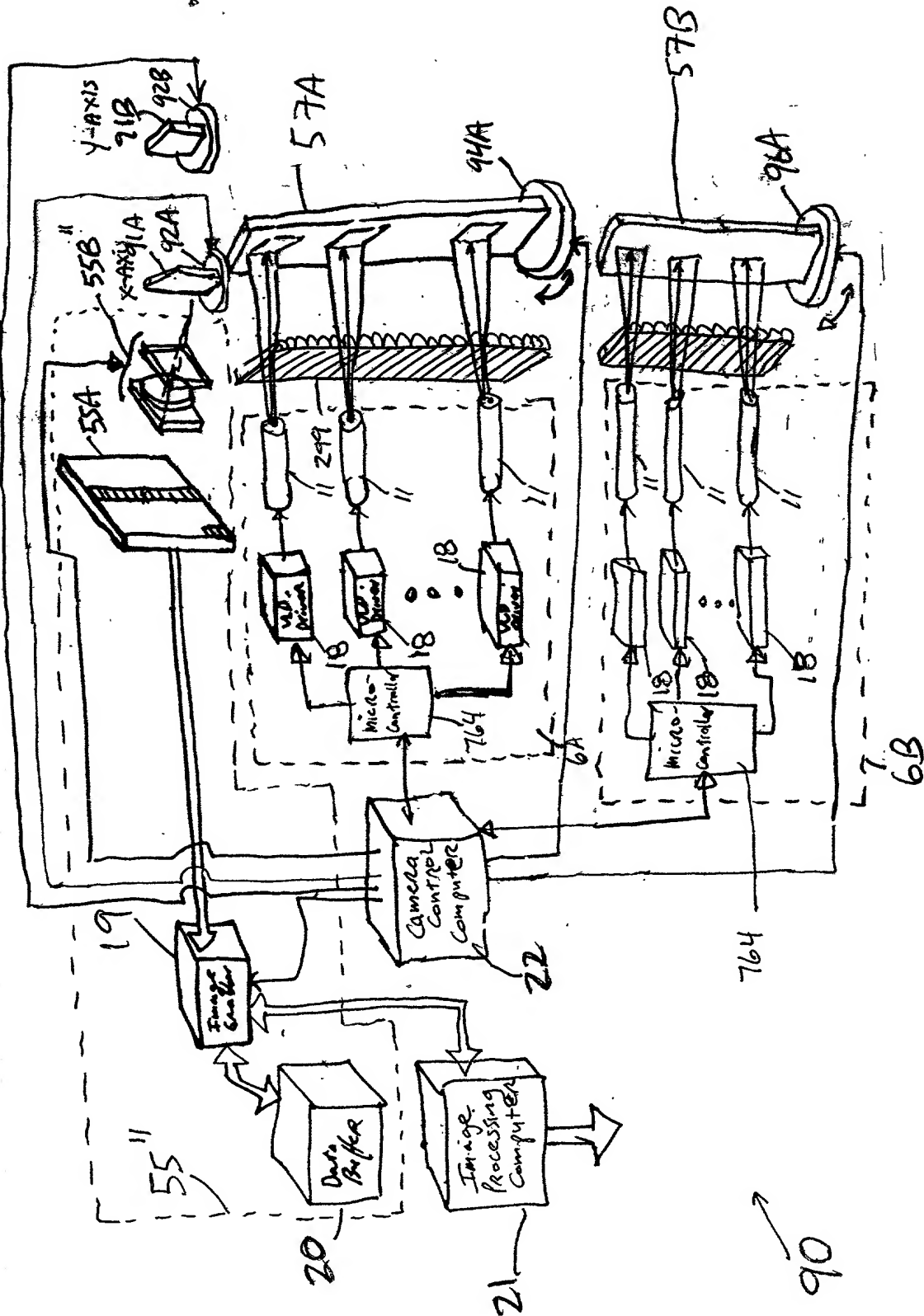


FIG. 6E3

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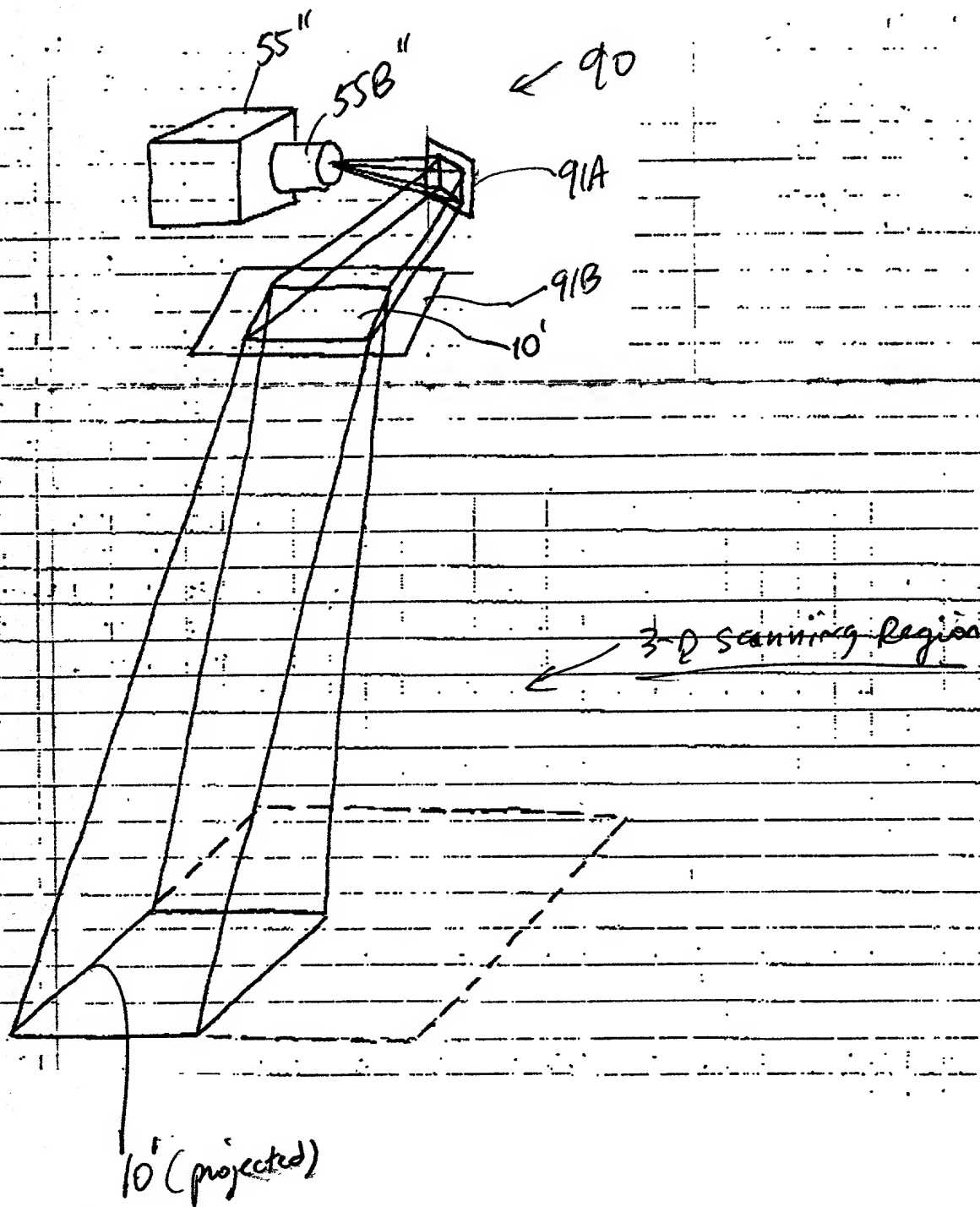
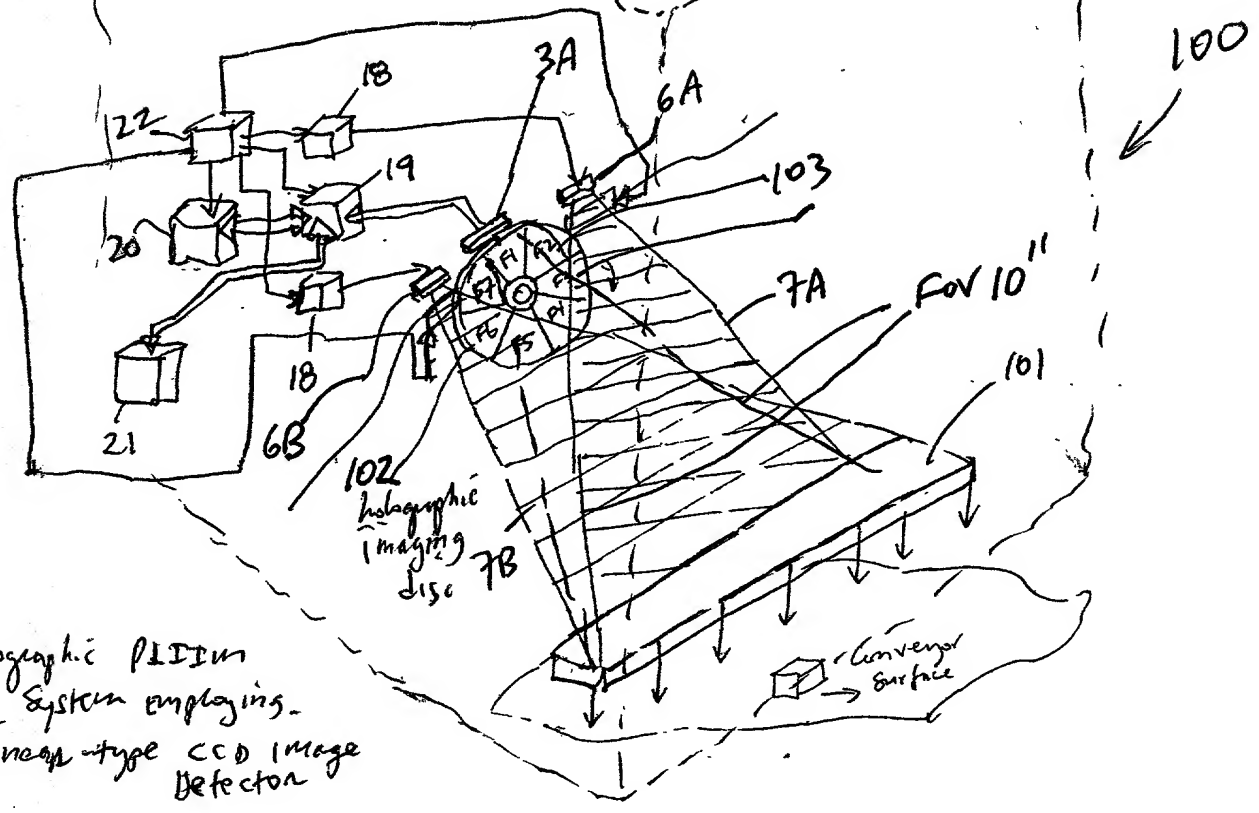


FIG. 6E4

10058003-0206002



Holographic PIIIM
System employing
Linear-type CCD Image
Detector

FIG. 7A

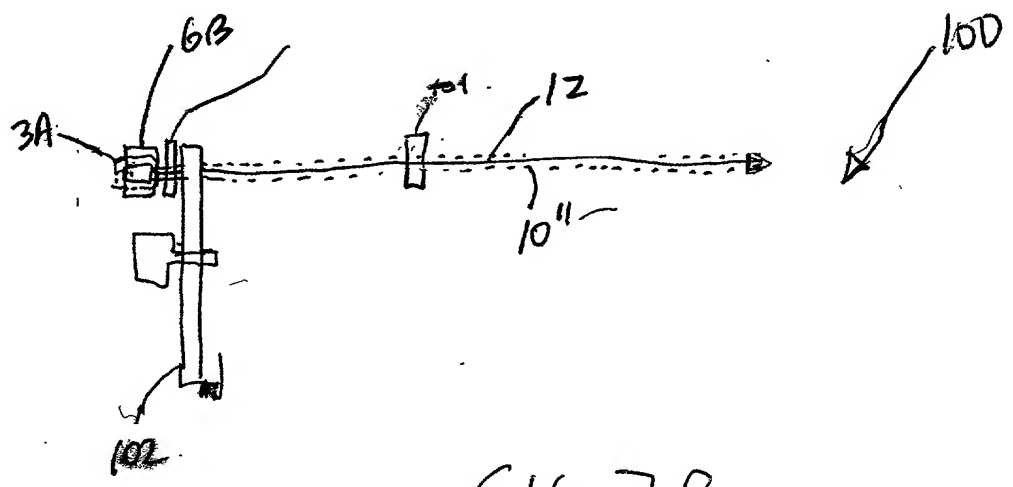


FIG. 7B

10068803-030600

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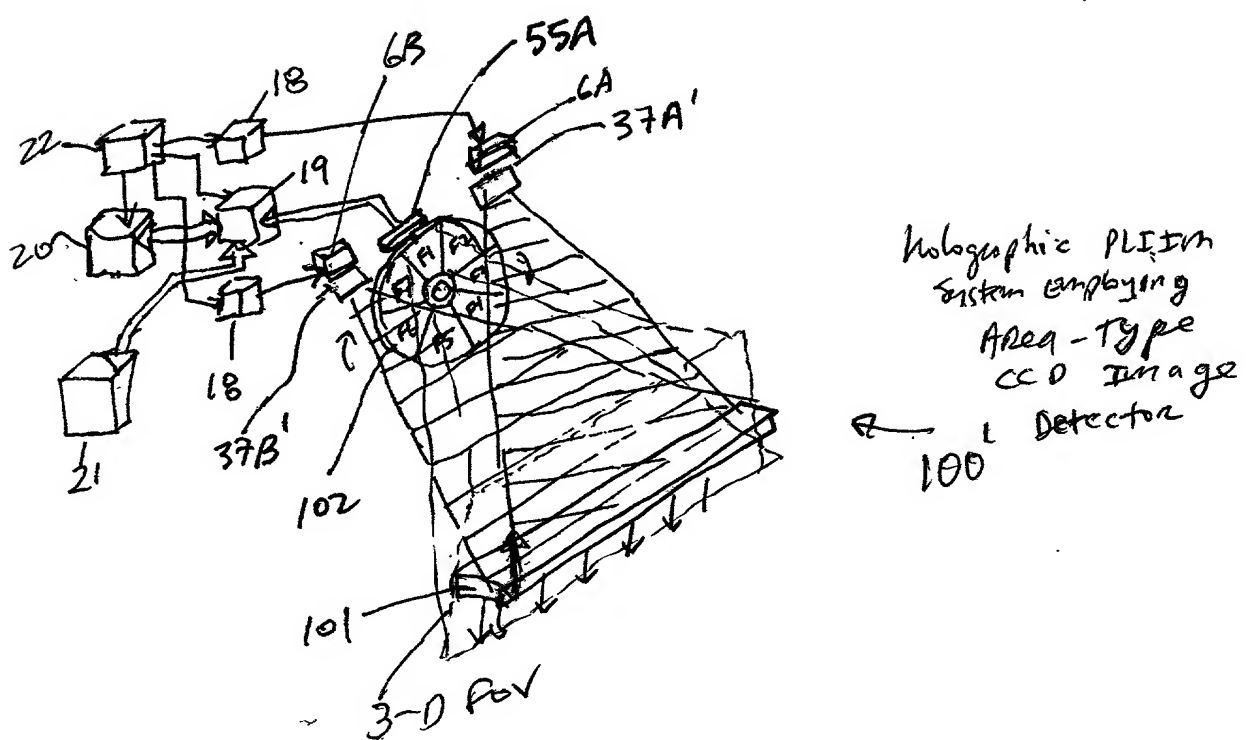


FIG. 8A

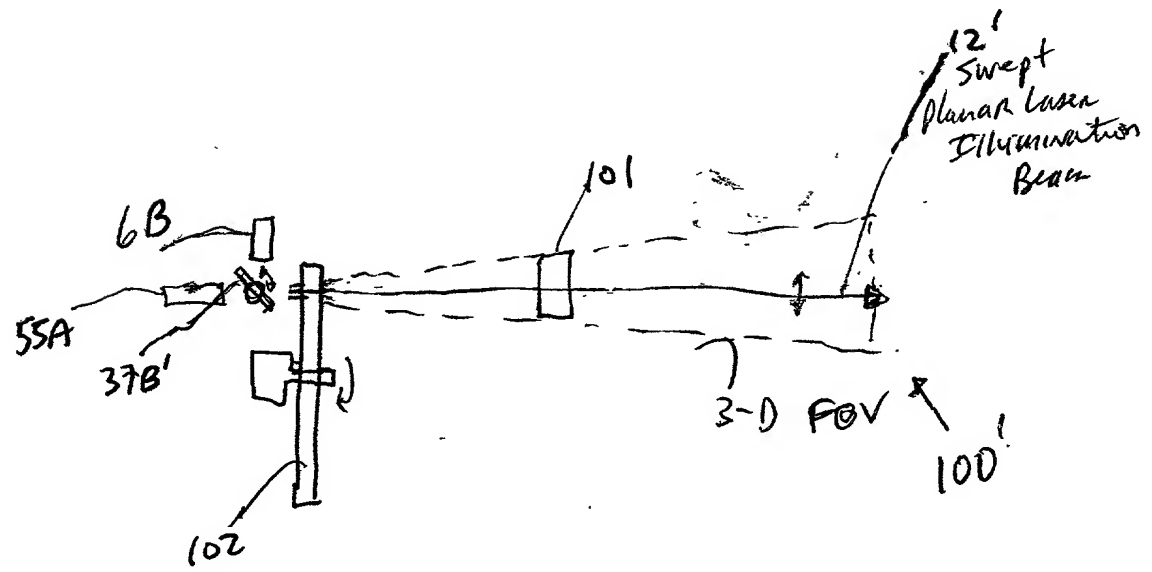


FIG. 8B

1-D CCD SCANNER EMBODIMENT

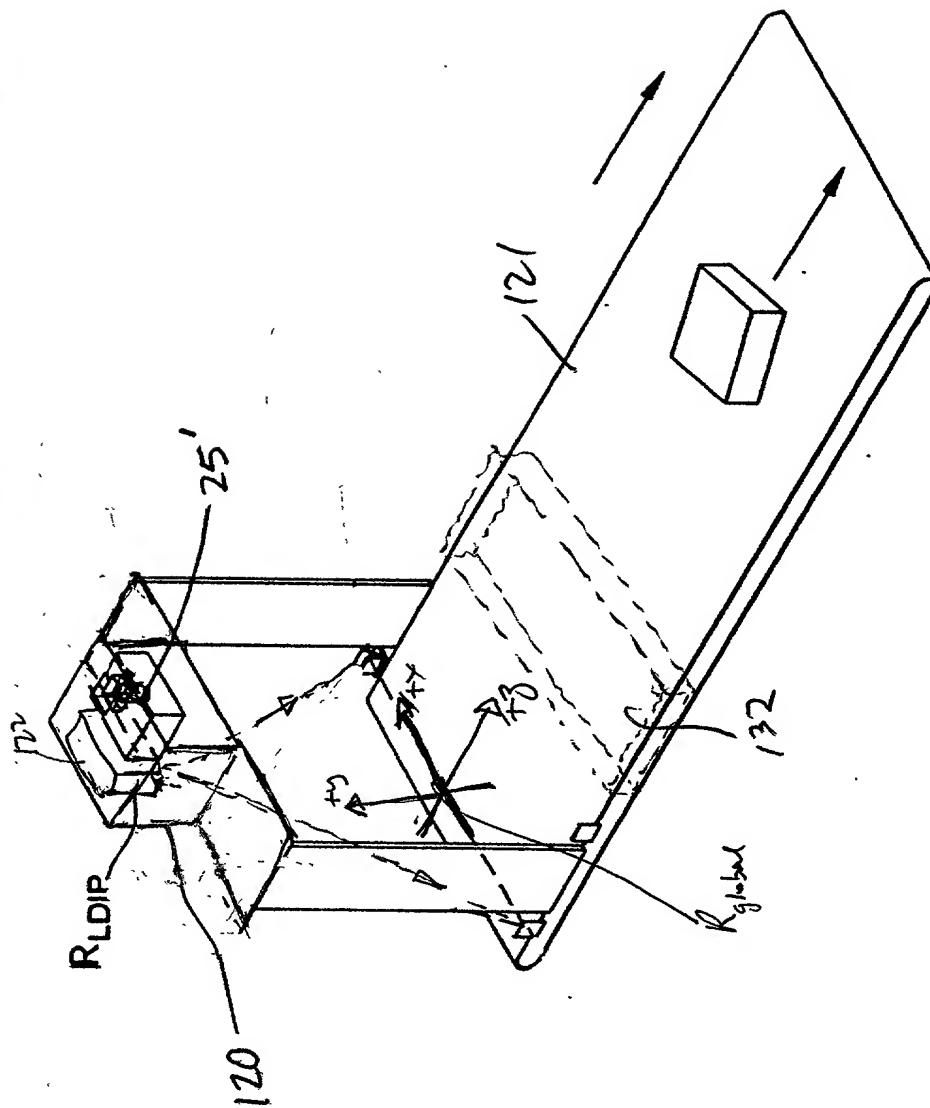


FIG. 9

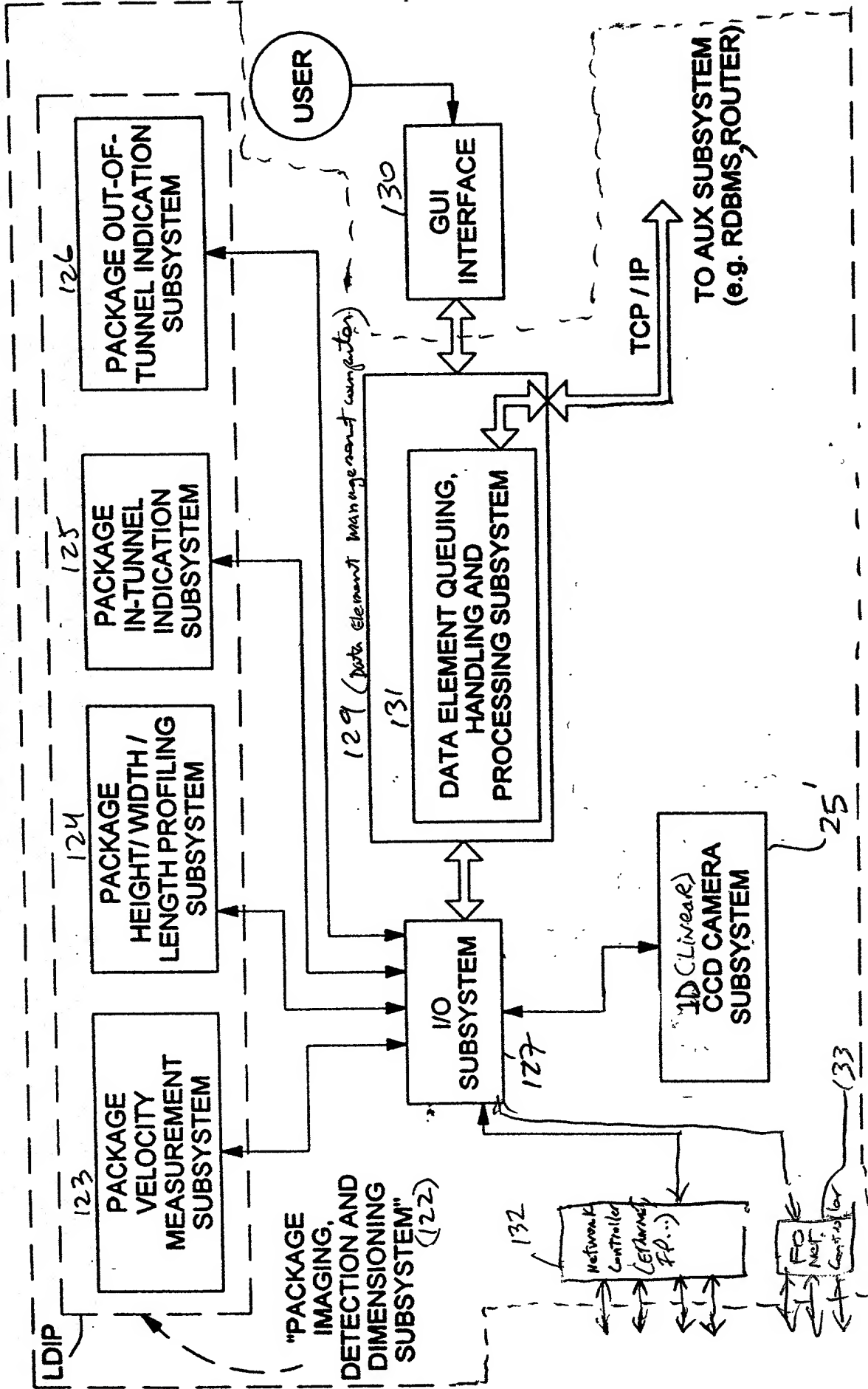


FIG. 10

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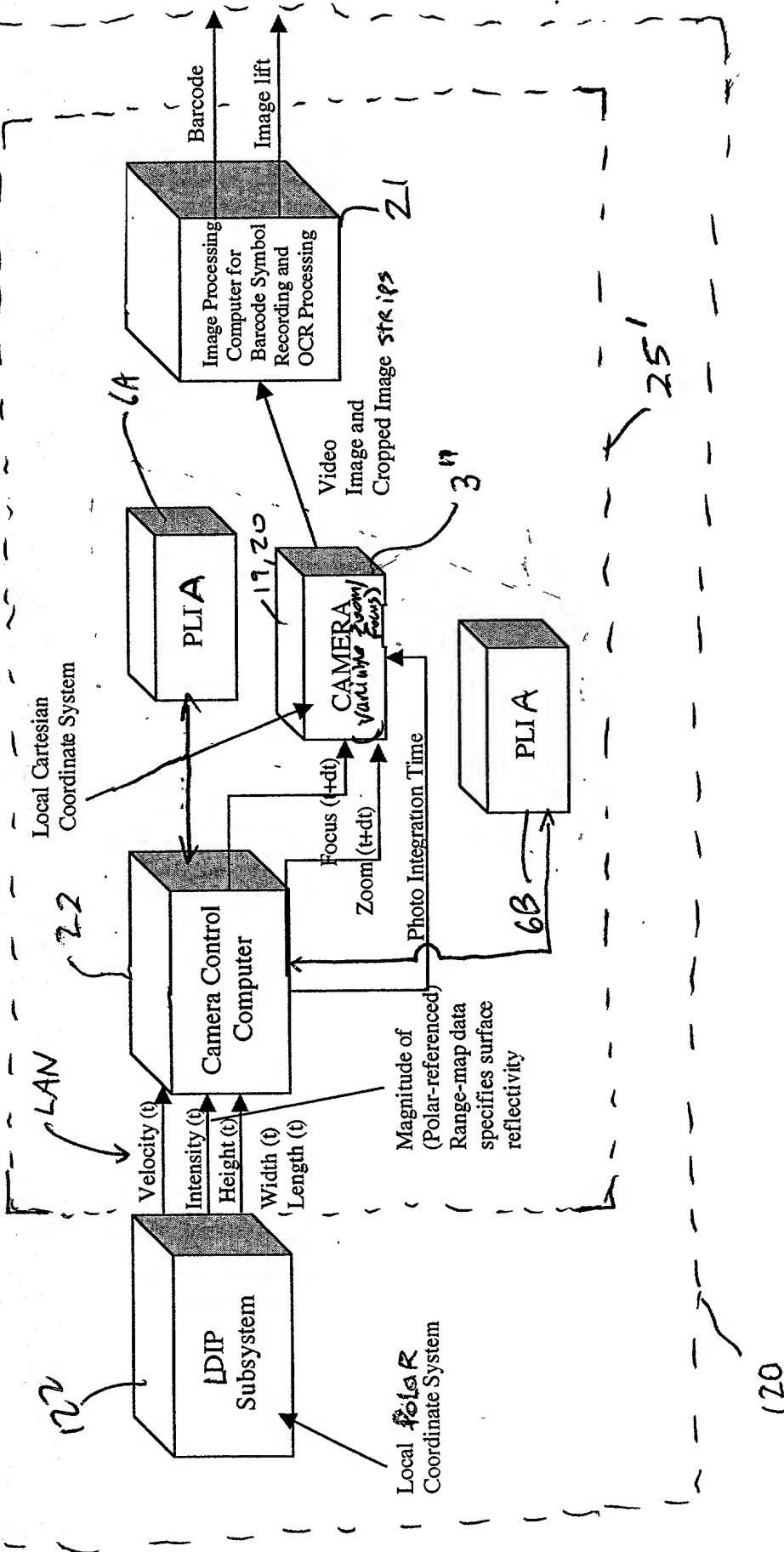


FIG. 11

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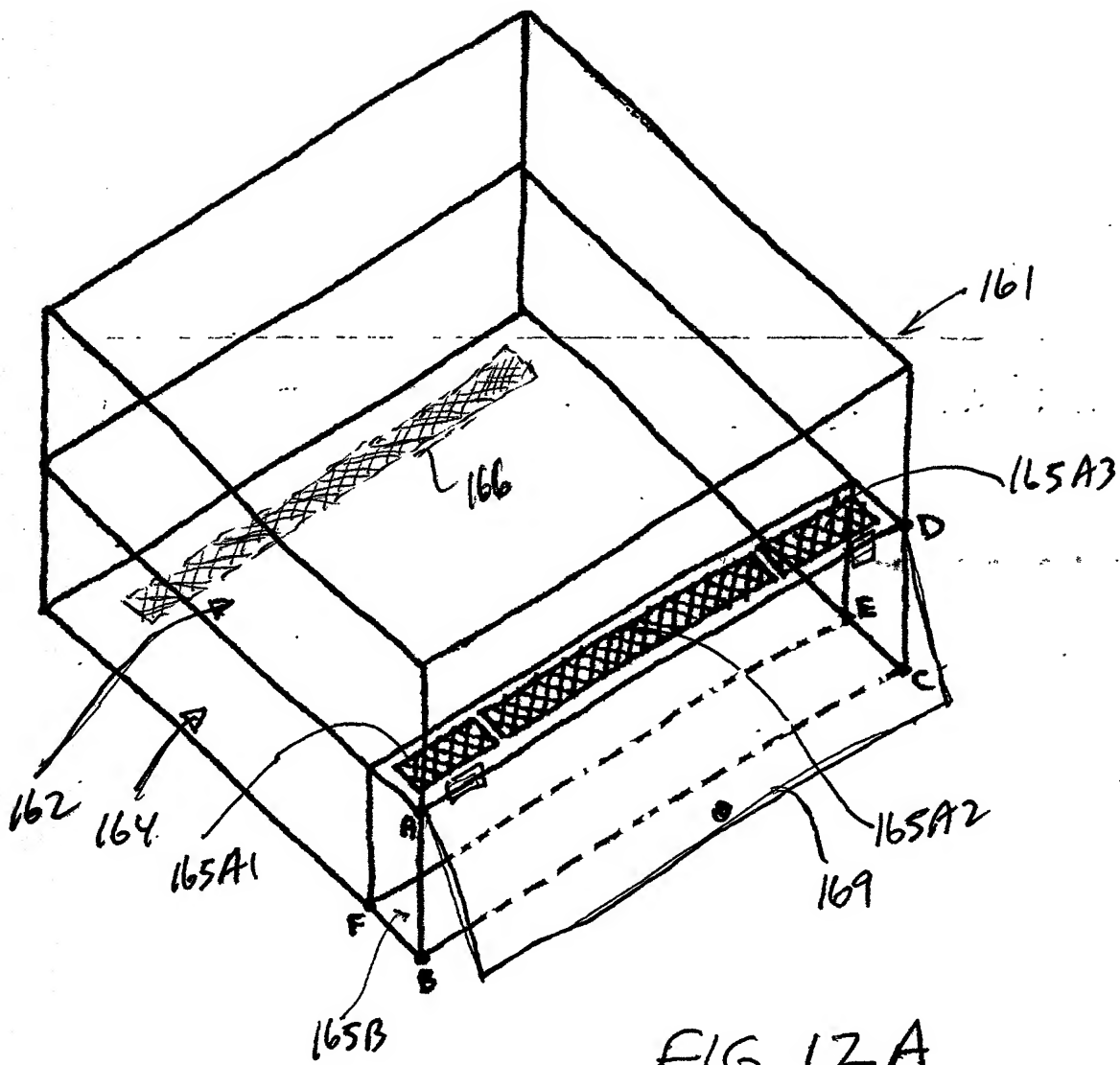


FIG. 12A

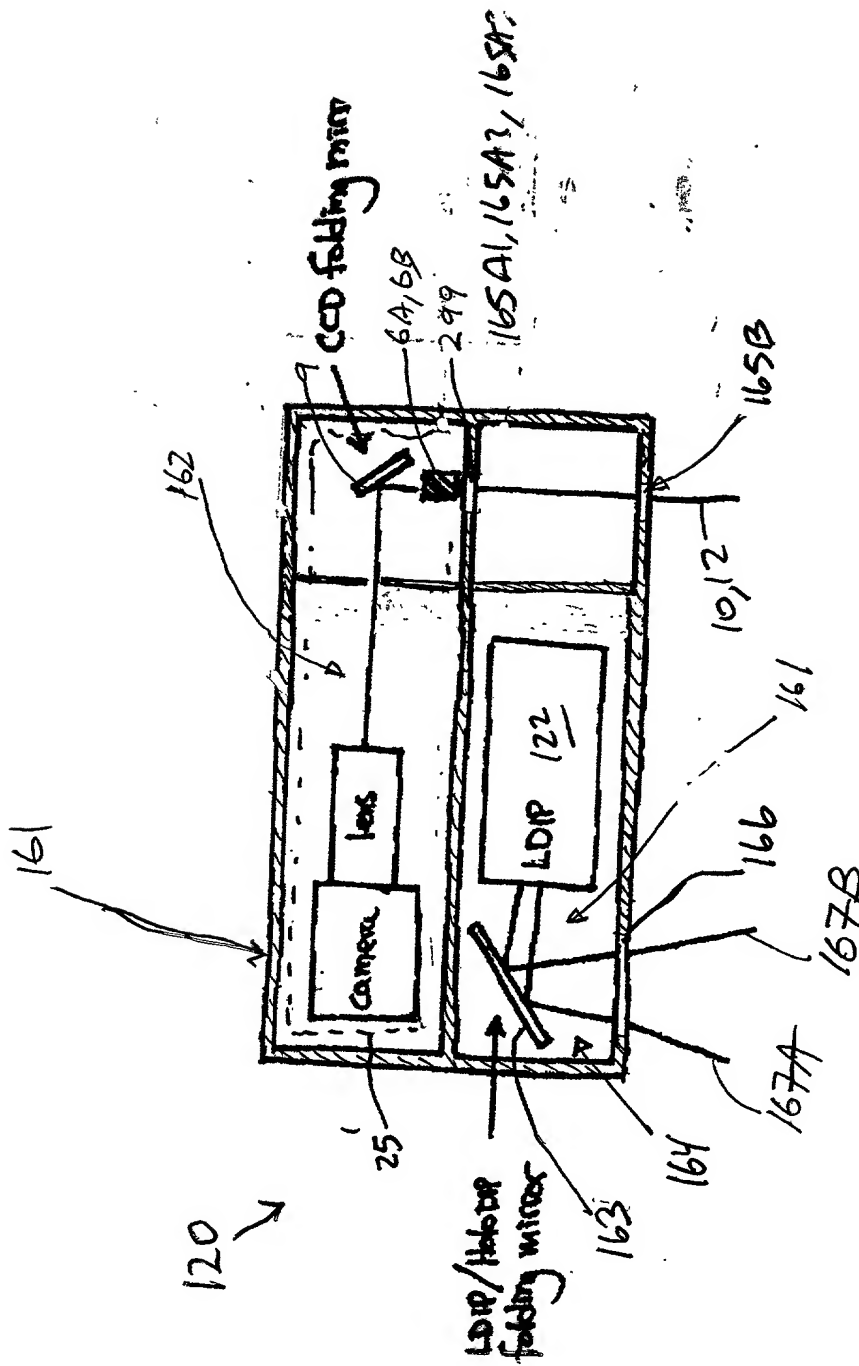


FIG. 12B

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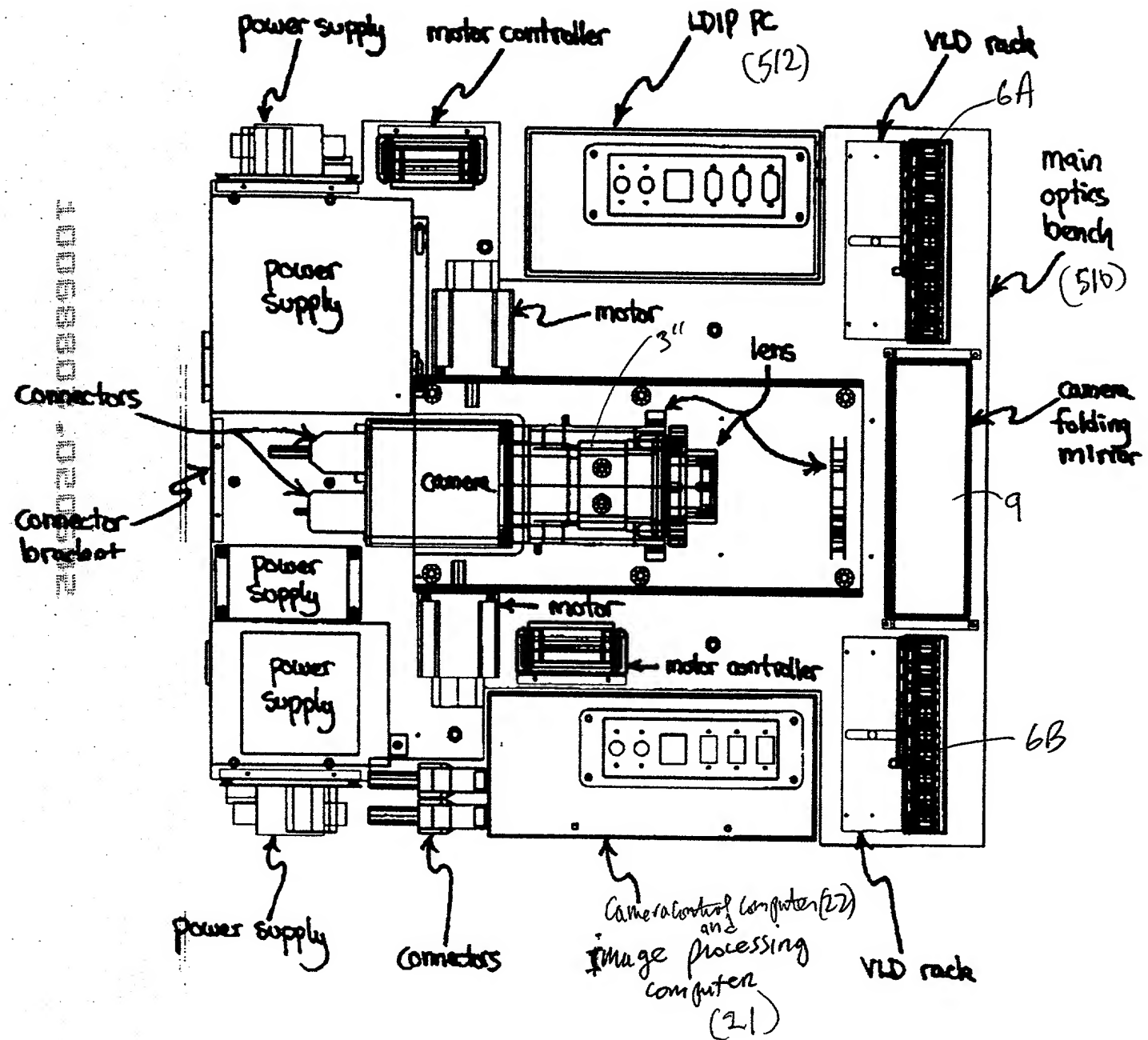


FIG. 12C

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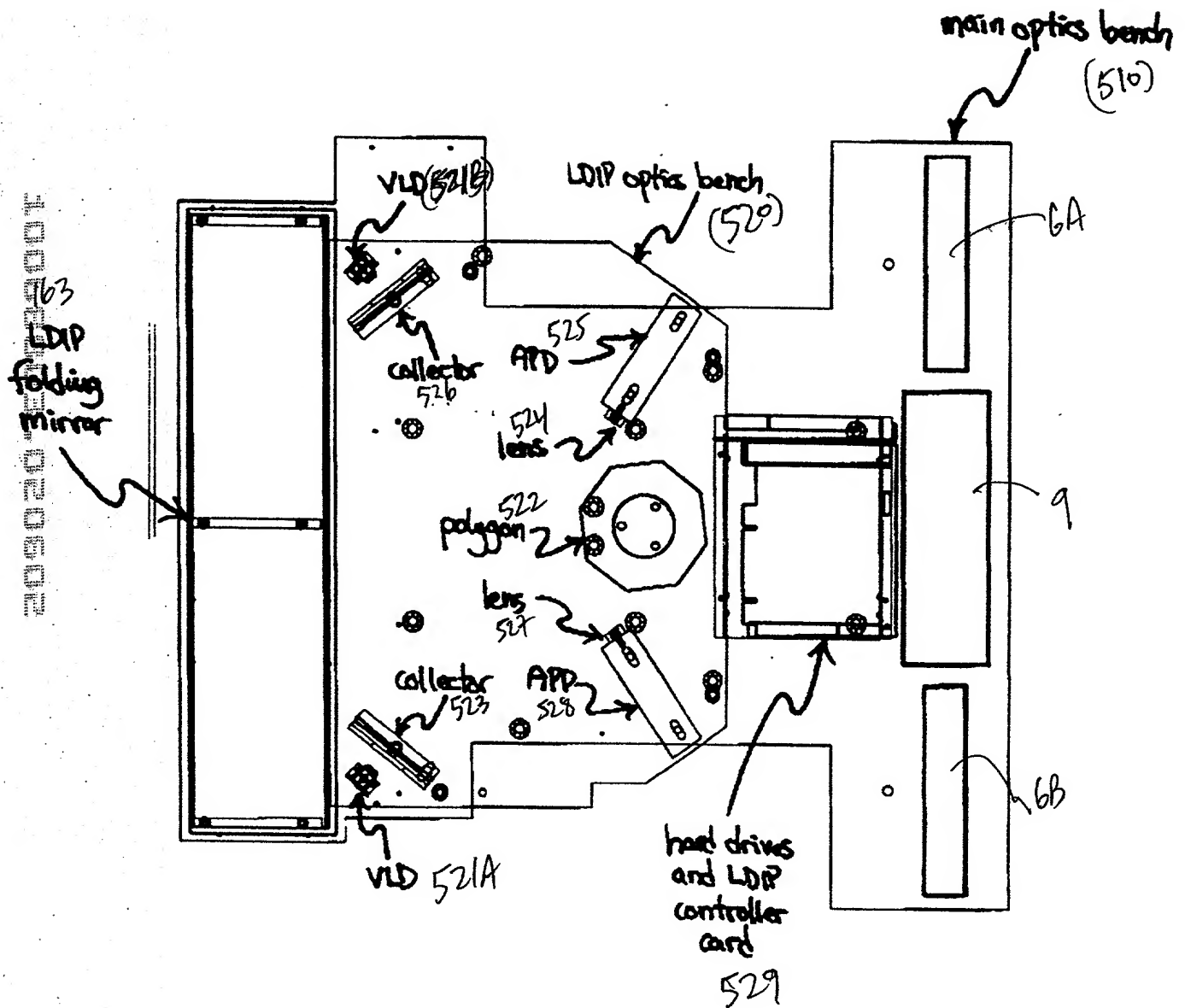
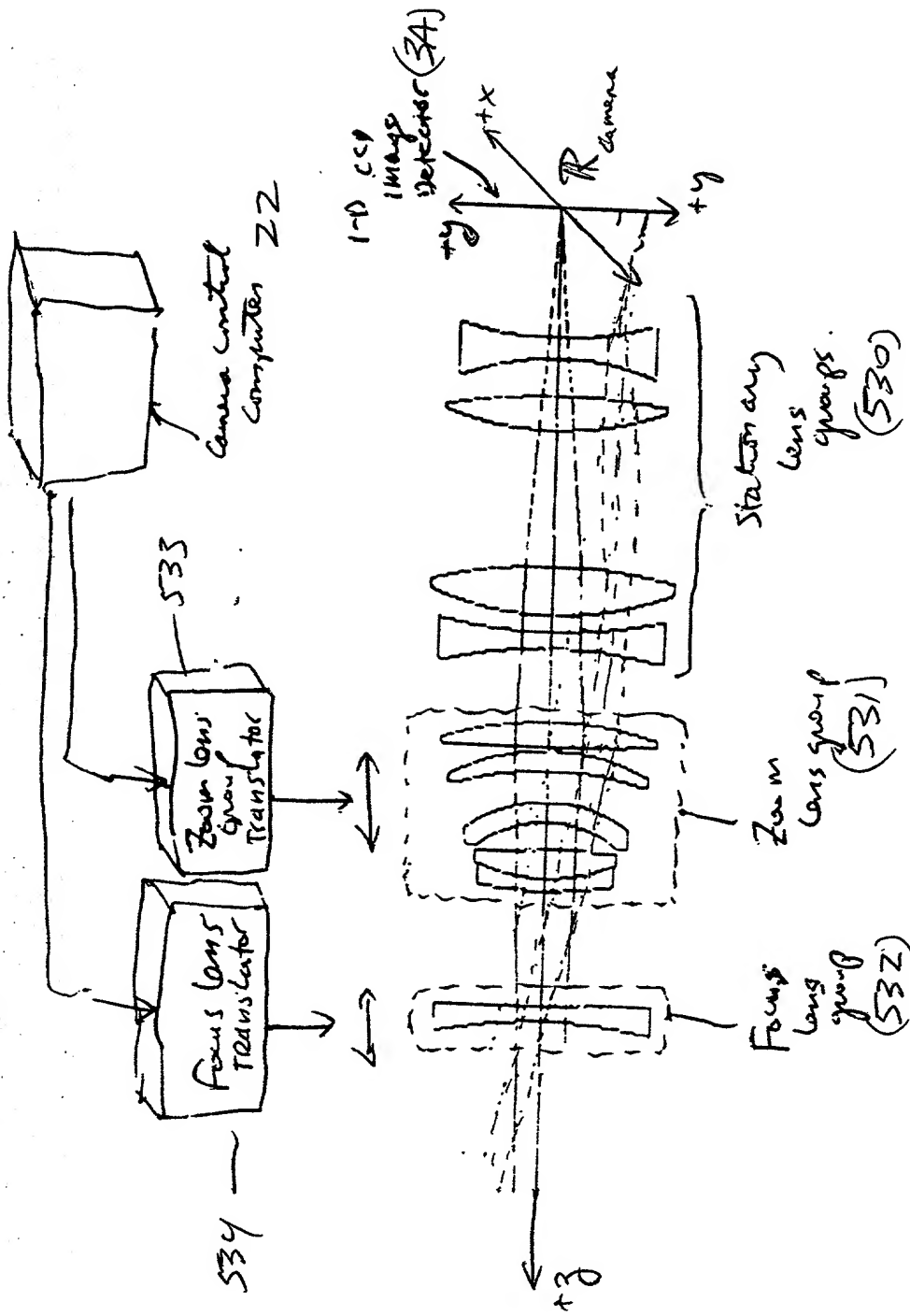


FIG. 12D



(main optics)
(lens groups)

FIG. 12E

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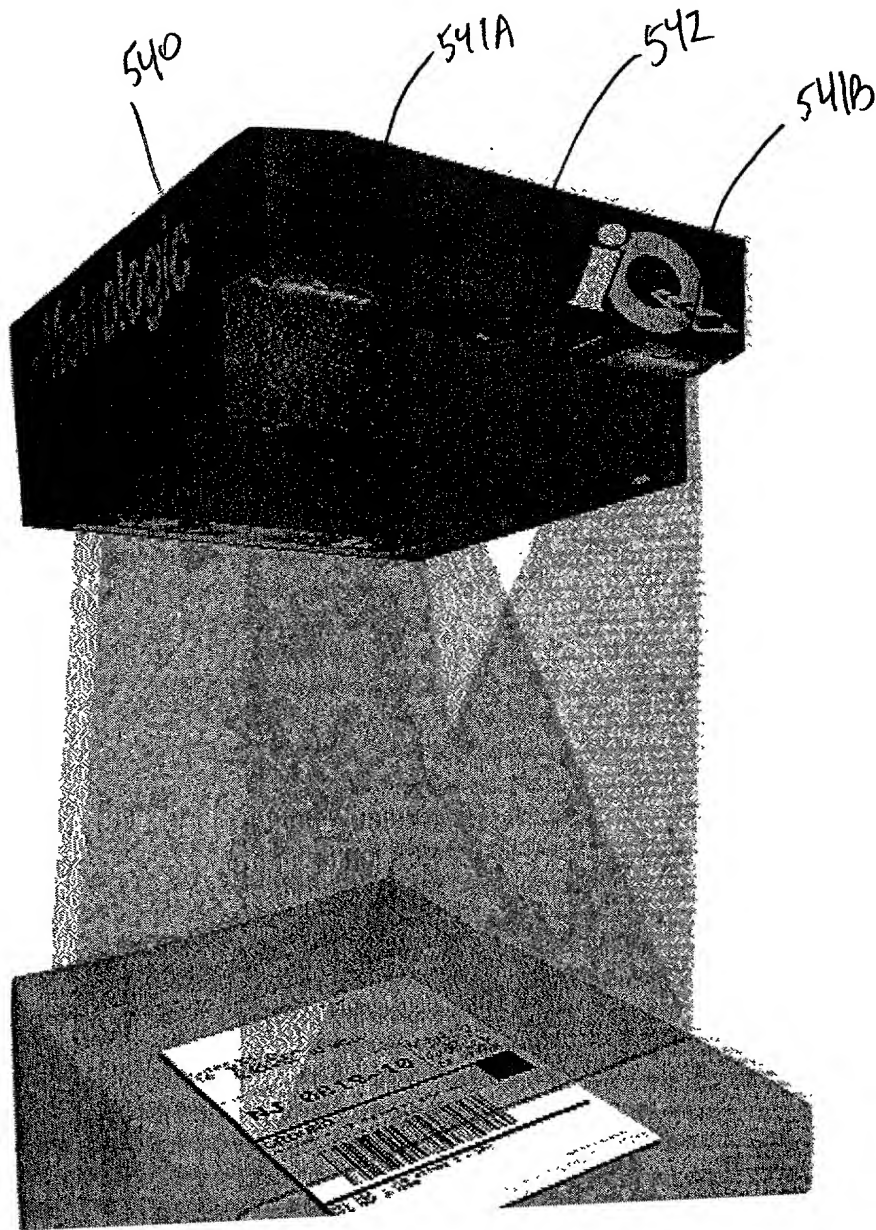


FIG. 13A

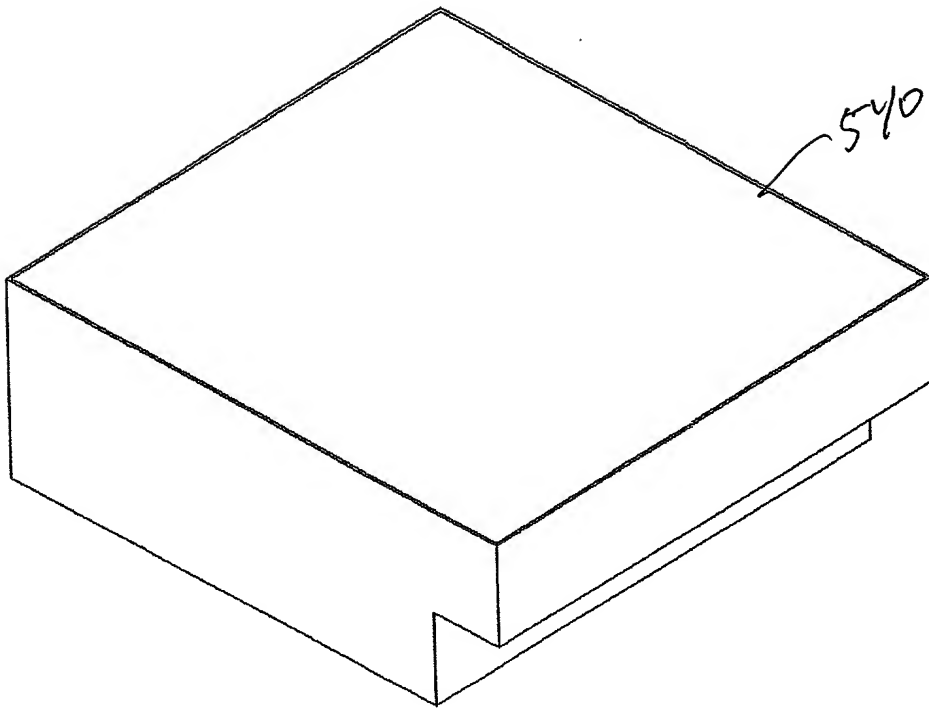


FIG. 13B

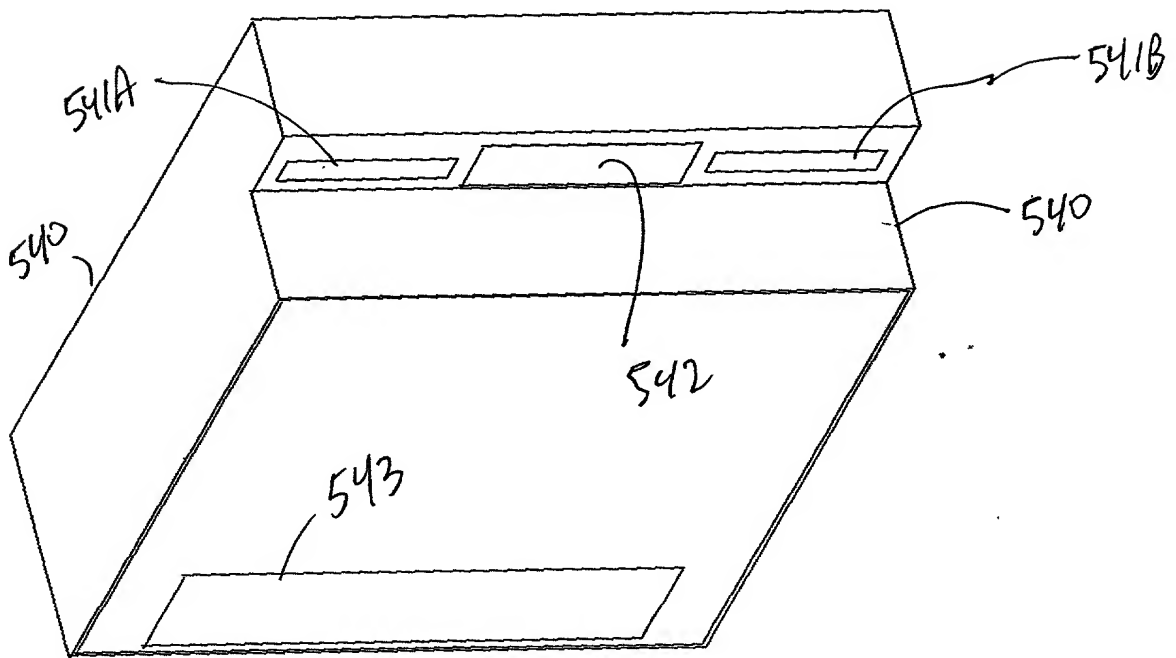


FIG. 13C

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PLLIM-BASED PACKAGE IDENTIFICATION AND DIMENSIONING (PID) SYSTEM

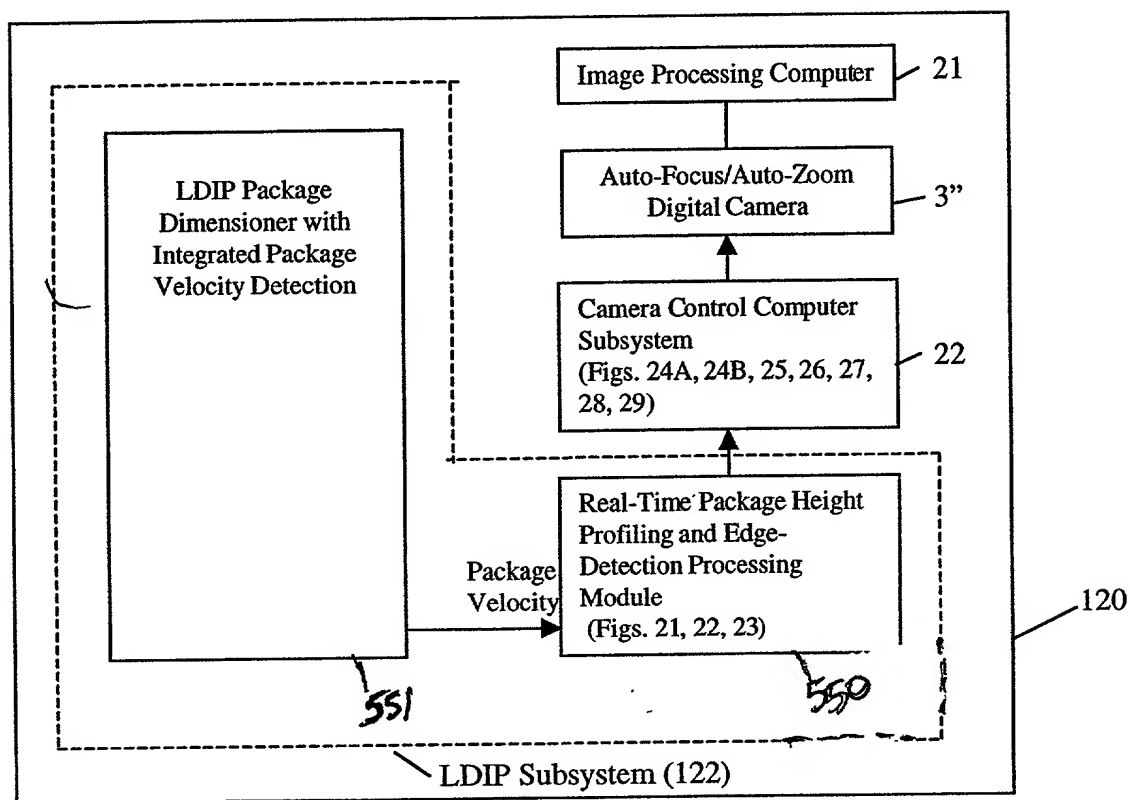


FIG. 14

LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

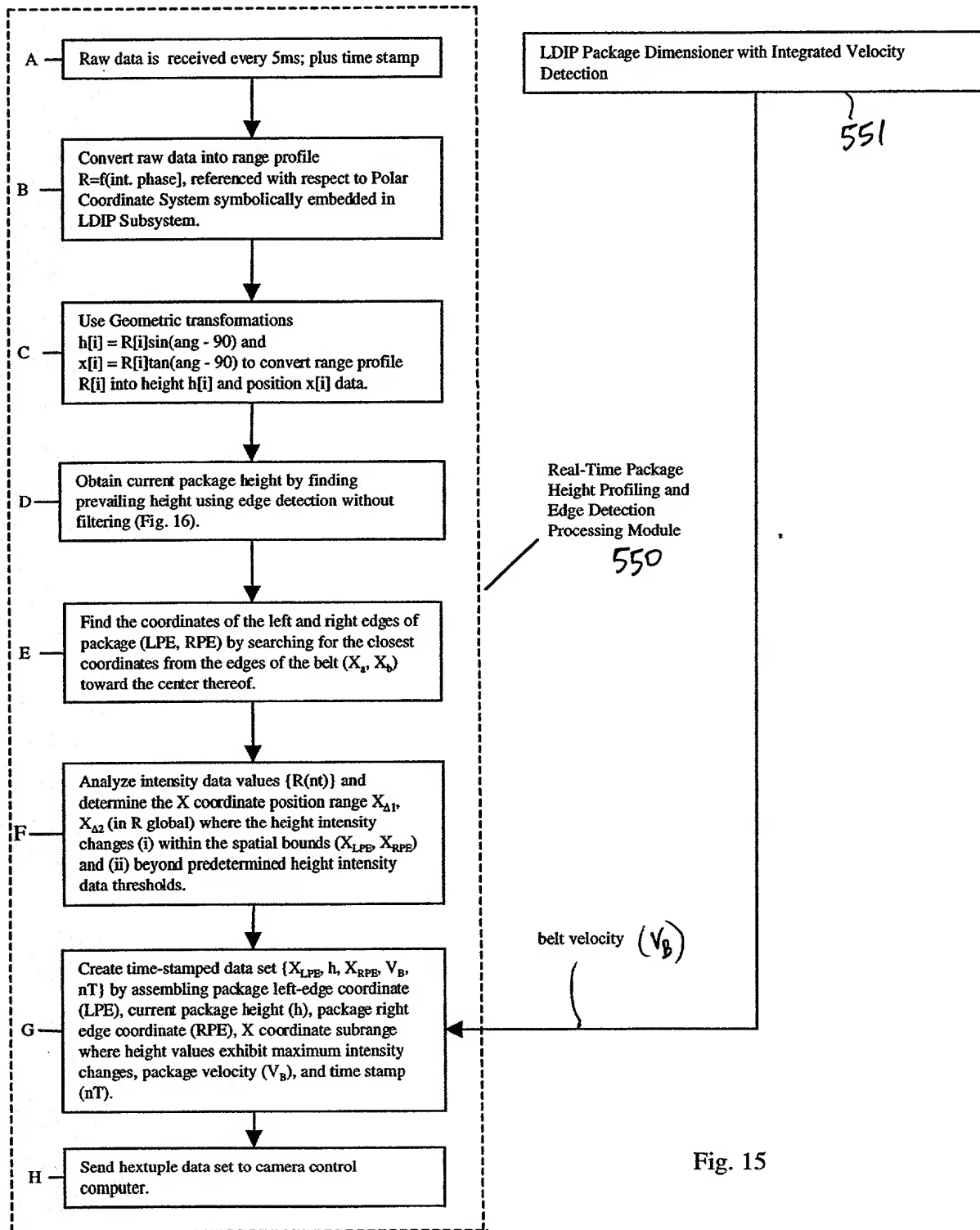
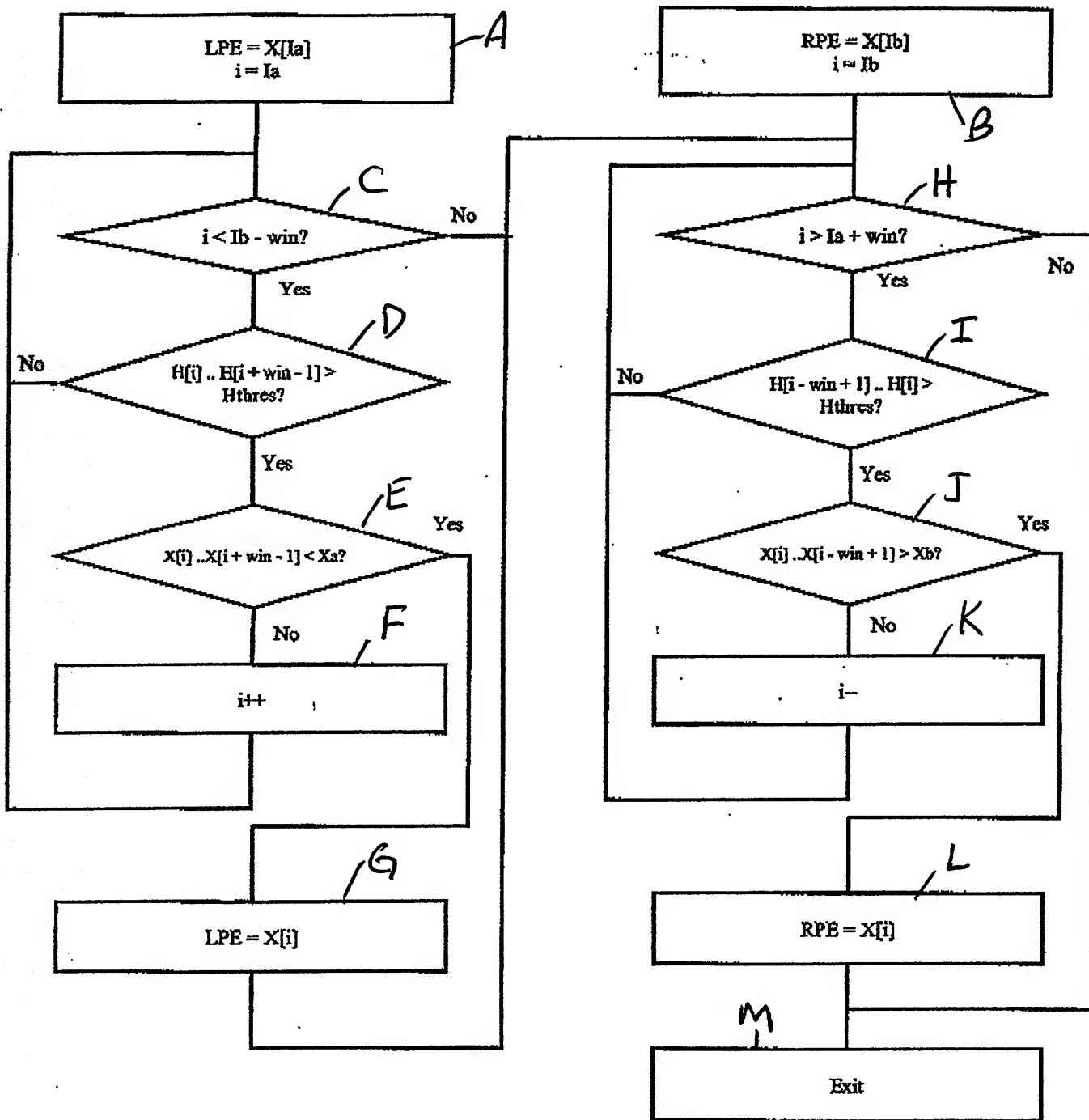


Fig. 15

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LDIP Real Time Package Edge Detection



Xa = location of belt left edge; Xb = location of belt right edge
 Ia = belt edge edge pixel; Ib = belt right edge pixel
 LPE = Left package edge; RPE = Right package edge
 H[] = Pixel height array; X[] = Pixel location array
 win = package detection window

FIG. 16

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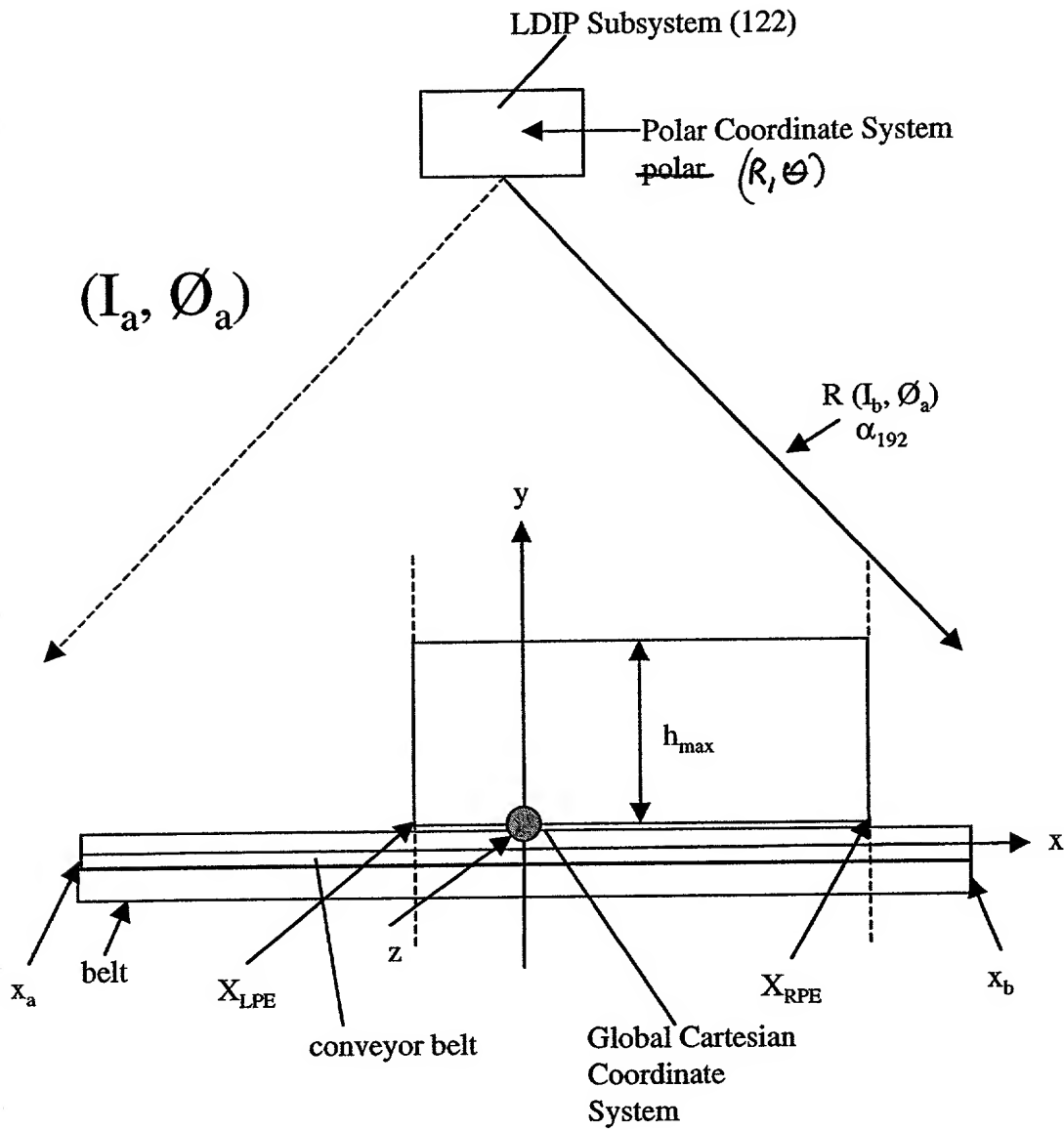


Fig. 17

INFORMATION MEASURED AT SCAN ANGLES BEFORE COORDINATE TRANSFORMS

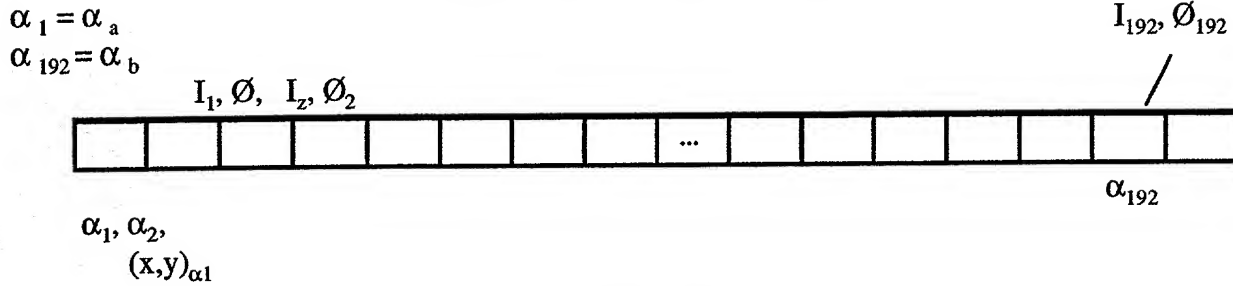


Fig. 17A

RANGE AND POLAR ANGLE MEASURES TAKEN AT SCAN ANGLE α BEFORE COORDINATE TRANSFORMS

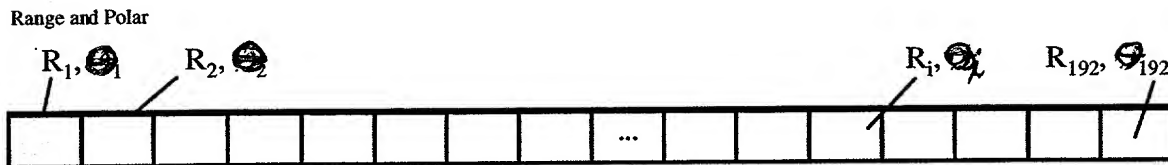


Fig. 17B

MEASURED PACKAGE HEIGHT AND POSITION VALUES AFTER COORDINATE TRANSFORMS

$H[]$
Input height after
coordinate transforms

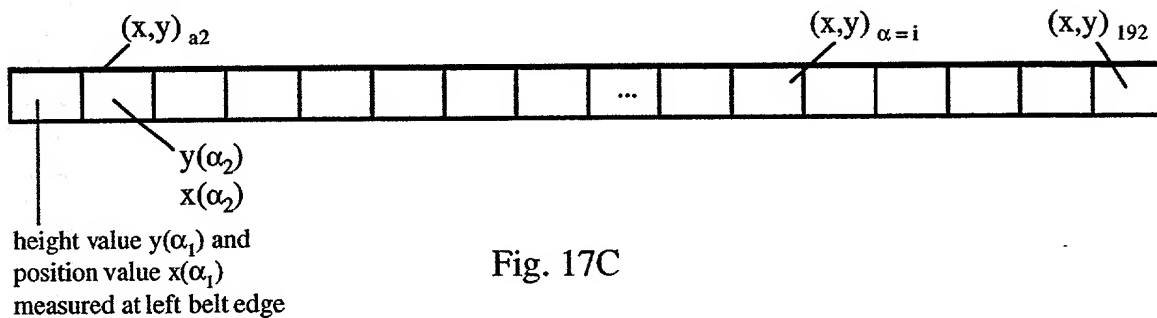


Fig. 17C

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CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA CONTROL SUBSYSTEM OF EACH OBJECT ATTRIBUTE ACQUISITION AND ANALYSIS SYSTEM

560

10068803-0206002

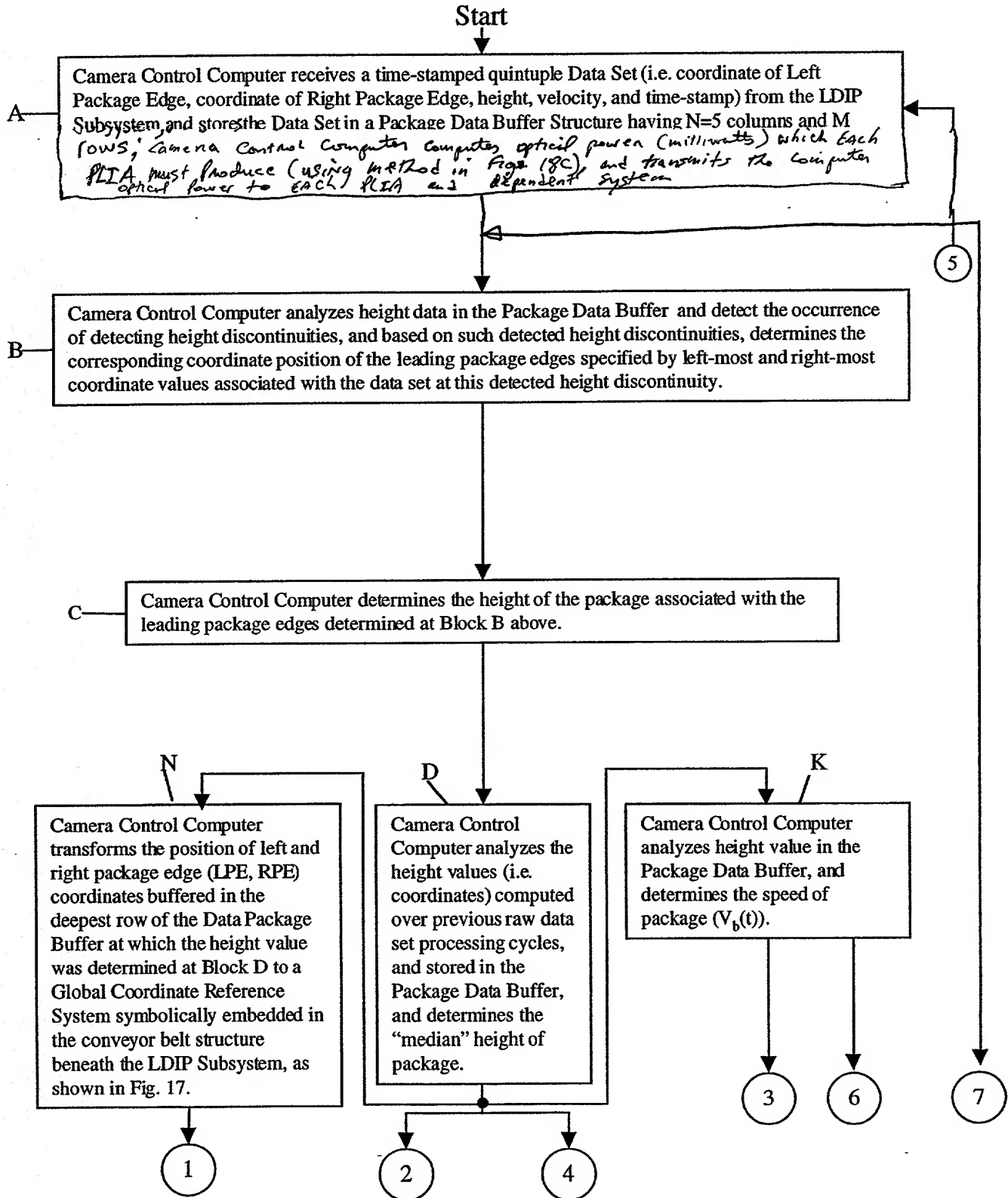


Fig. 18A

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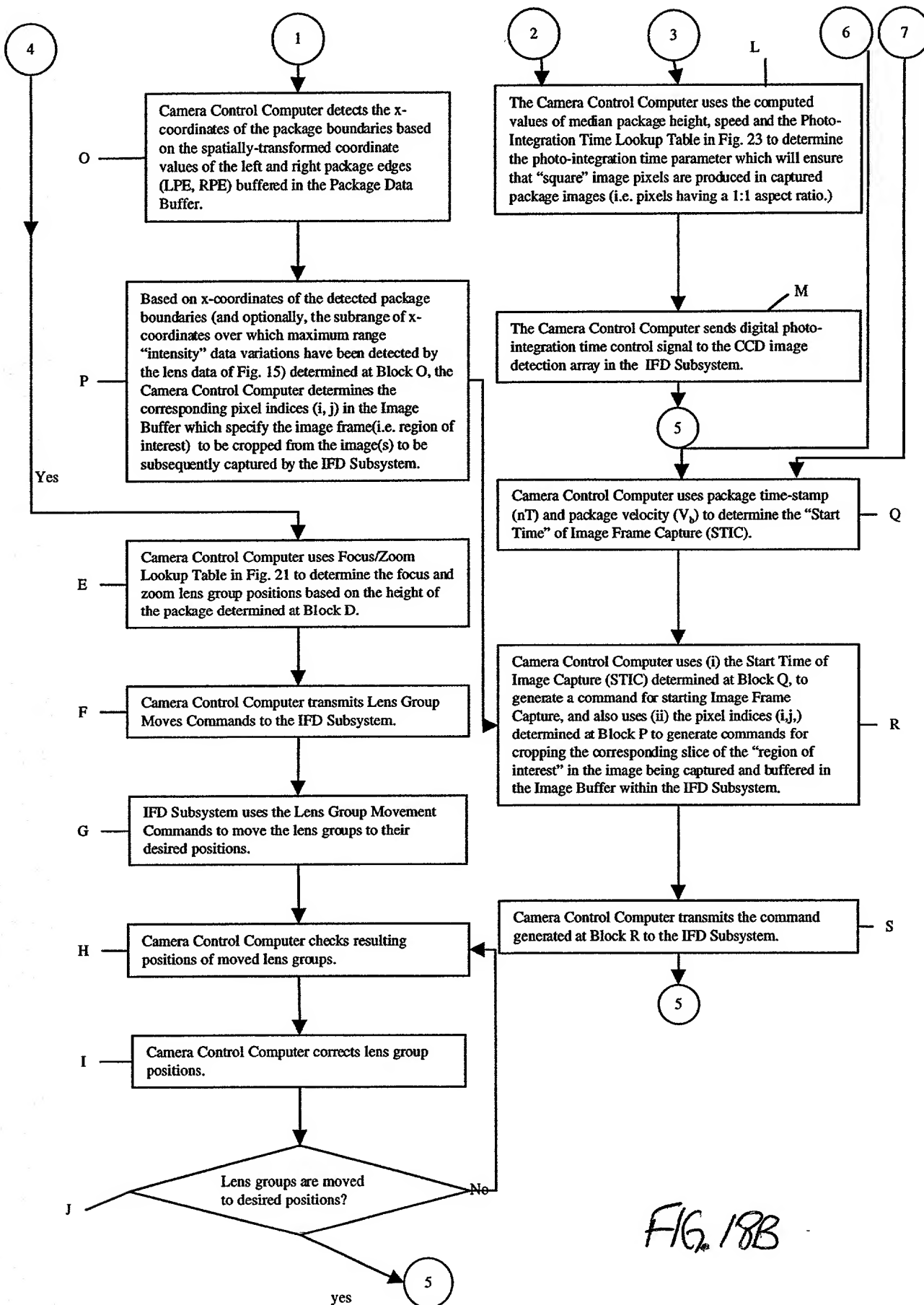


FIG. 18B

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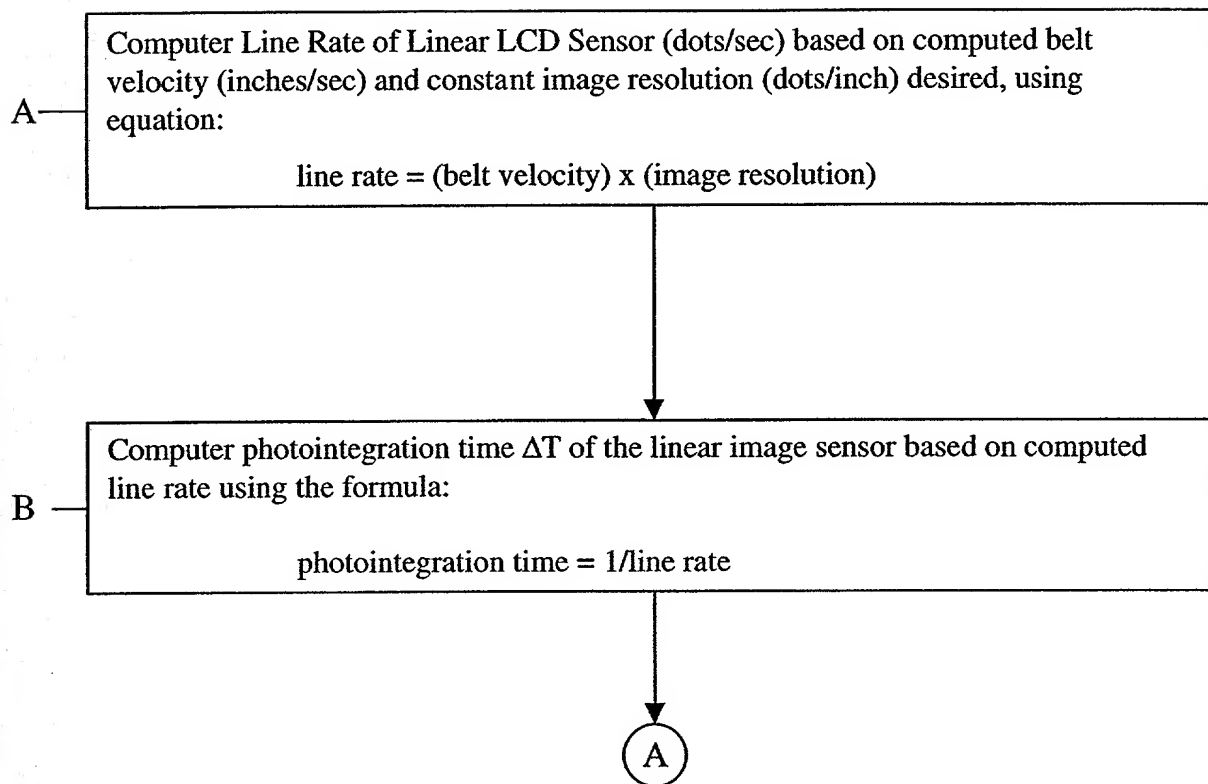


Fig. 18C1

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Compute optical power (milliwatts) of each PLIA based on computed photointegration time (ΔT) using the following formula:

$$\text{optical power of LD (milliwatts)} = \frac{\text{constant}}{\text{photointegration time } \Delta T}$$

Fig. 18C2

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X coordinate subrange where
maximum range "intensity"
variations have been detected

Left Package Edge (LDE)	Package Height (h)	Right Package Edge (RPE)	Package Velocity	Time-stamp (nT)	
					Row 1
					Row 2
					Row 3
					Row 4
					Row 5
					Row M

Package Data Buffer (FIFO)

Fig. 19

																				Columns	
																					Rows

Camera Pixel Data Buffer
pixel indices (i,j)

Fig. 20

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Week-48 TAB 6

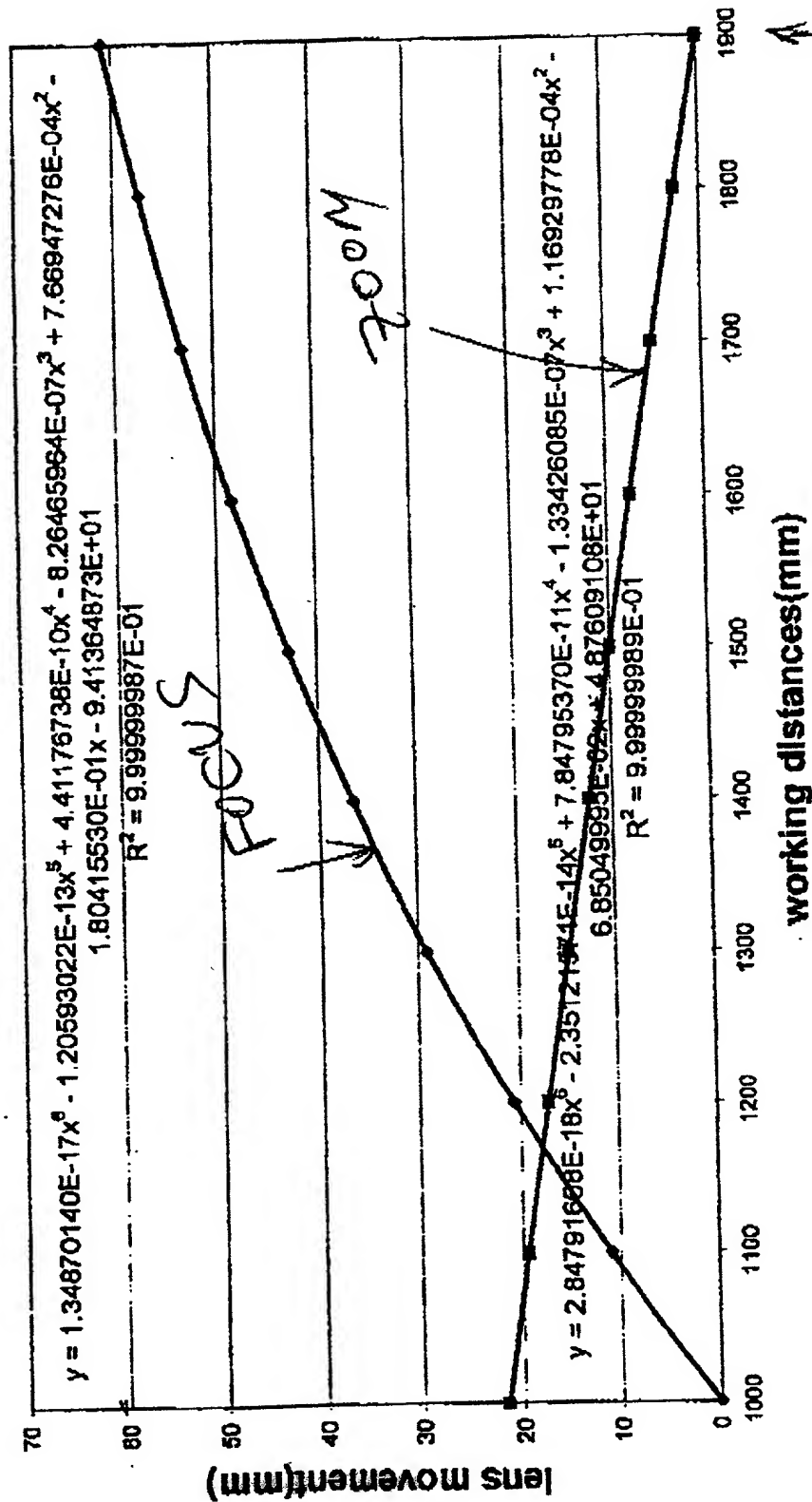
FIG. 21

FIG. 21

209020' E0999900T

* Note: The focal distance & zoom (eff. focal length) of camera lens are coupled (interdependent) in this camera has a fixed aperture F5.6

Focus and Zoom lens movement vs. working distances



— zoom 1 — zoom 2 — Poly. (zoom 1) — Poly. (zoom 2)

(inches) 36 above conveyor belt ← package height above conveyor

conveyor-belt surface

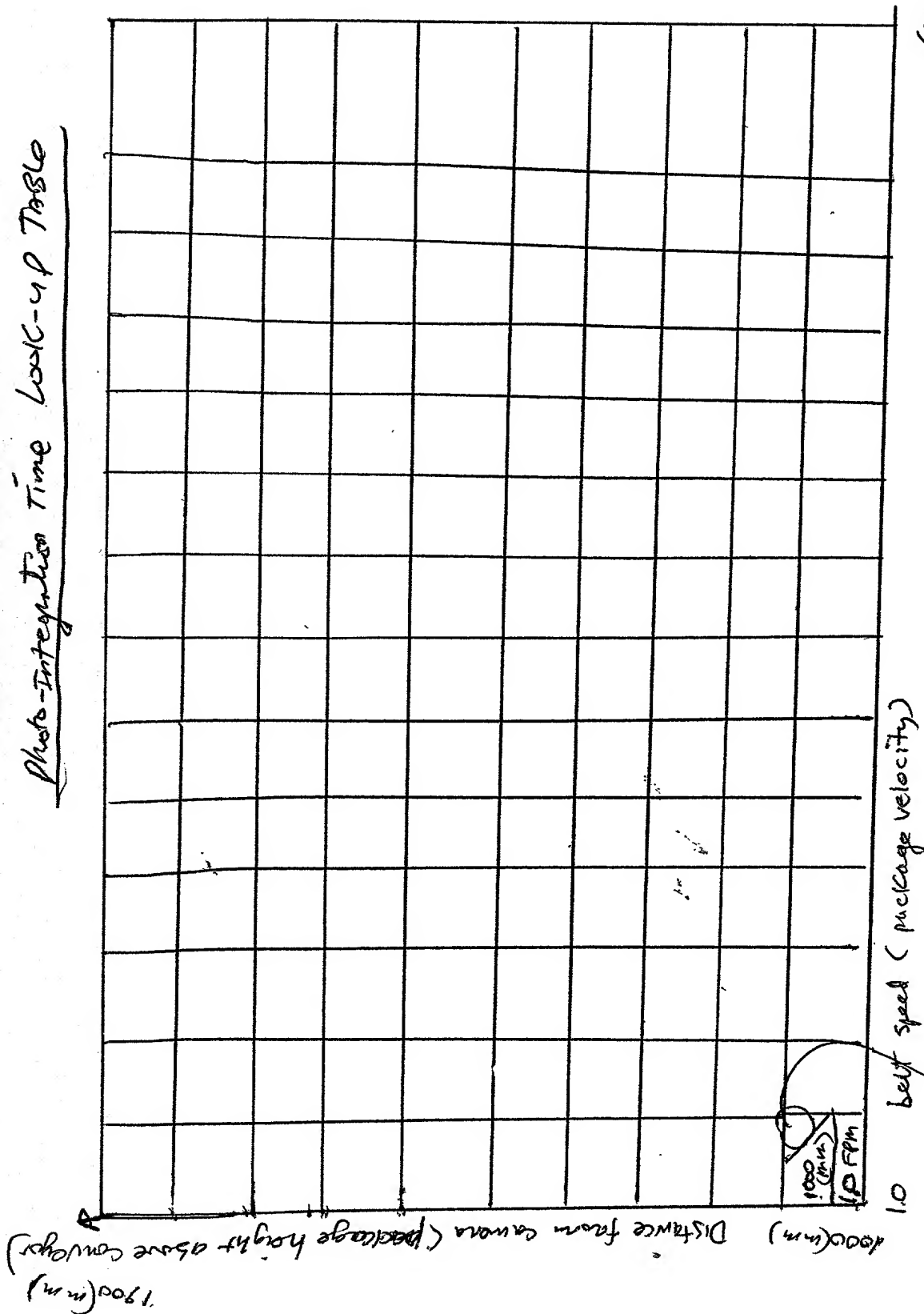
FIG. 22

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209020-008900T

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Photo-Integration Time Look-up Table



600 feet per minute
(FPM)

FIG. 23

Photo-Integration
Time value that
ensures square image pixels
(1:1 aspect ratio)

200020" 000000T

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LOW RESOLUTION 2D CCD CAMERA (61)
HIGH RESOLUTION 2D CCD CAMERA (55")

LDIP (122)

25"

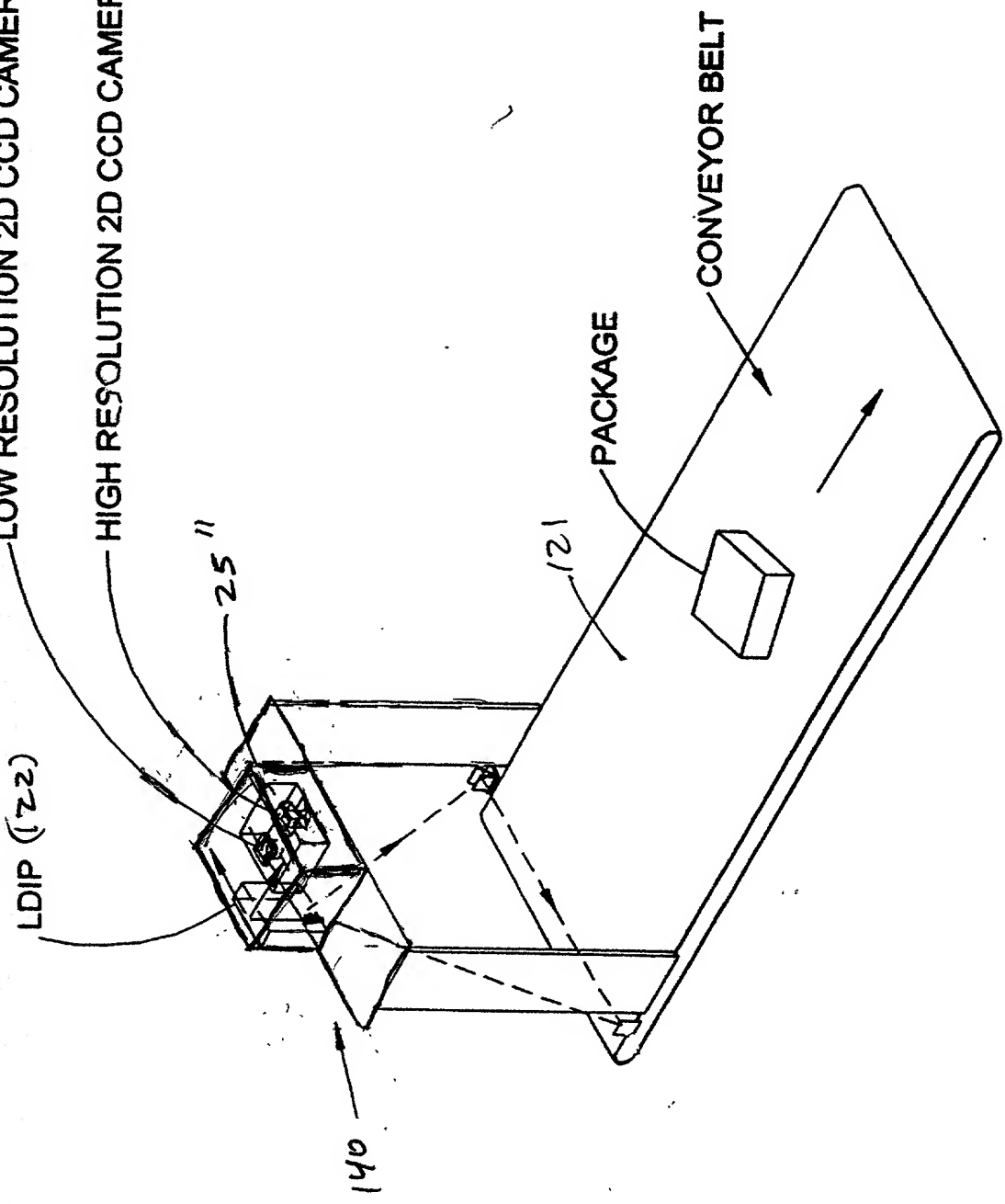
140

121

PACKAGE

CONVEYOR BELT

FIG 24



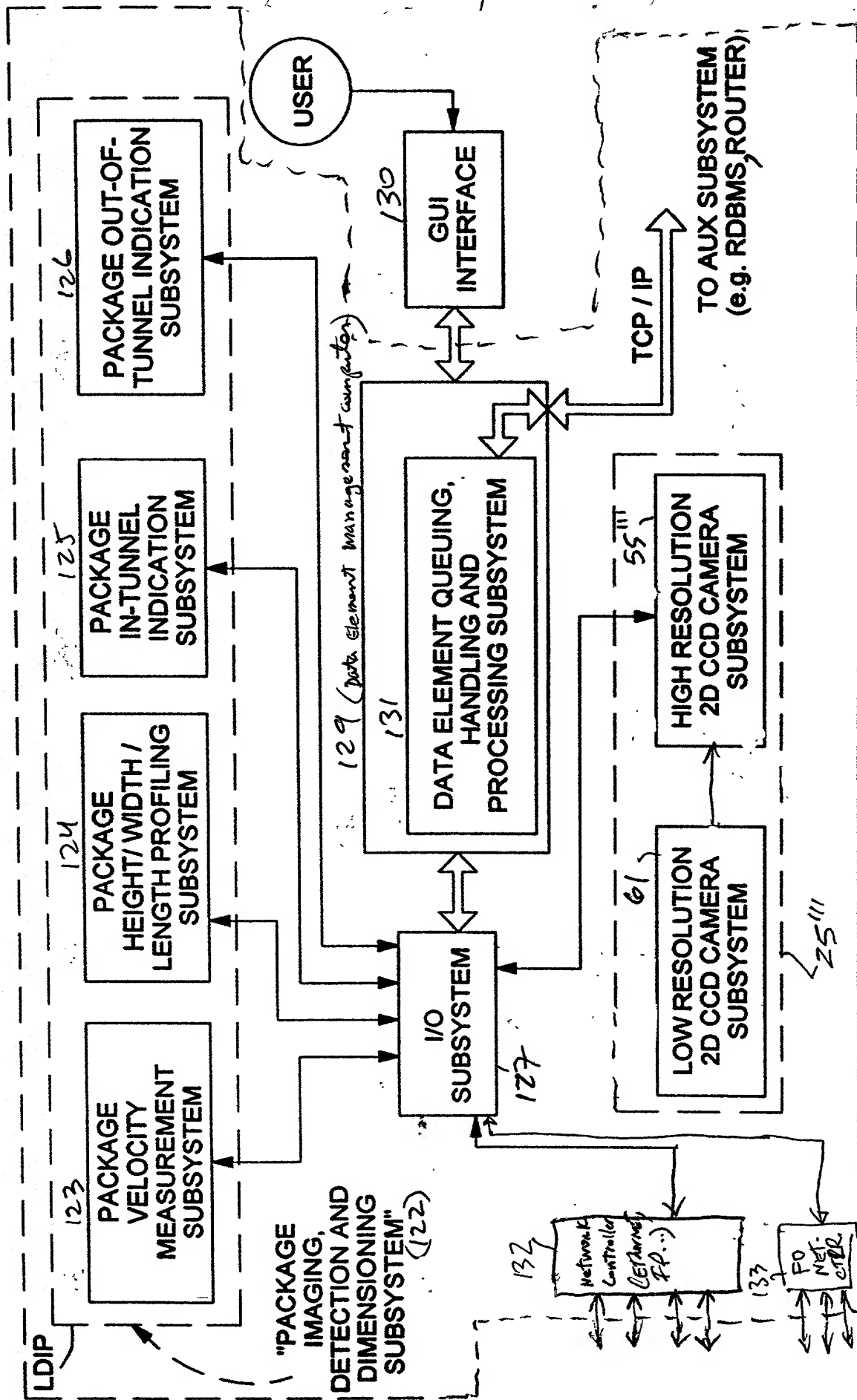


FIG. 25

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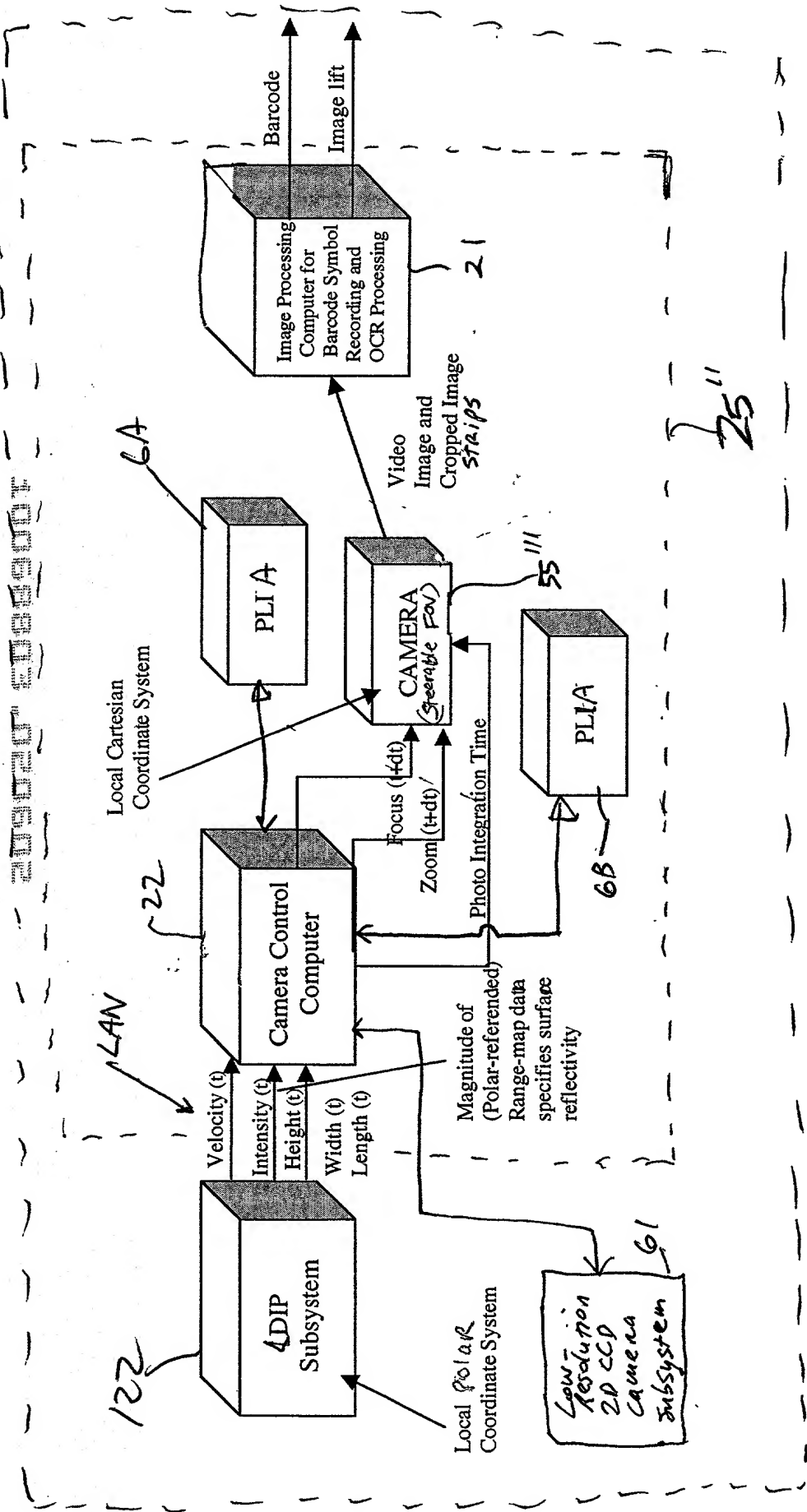
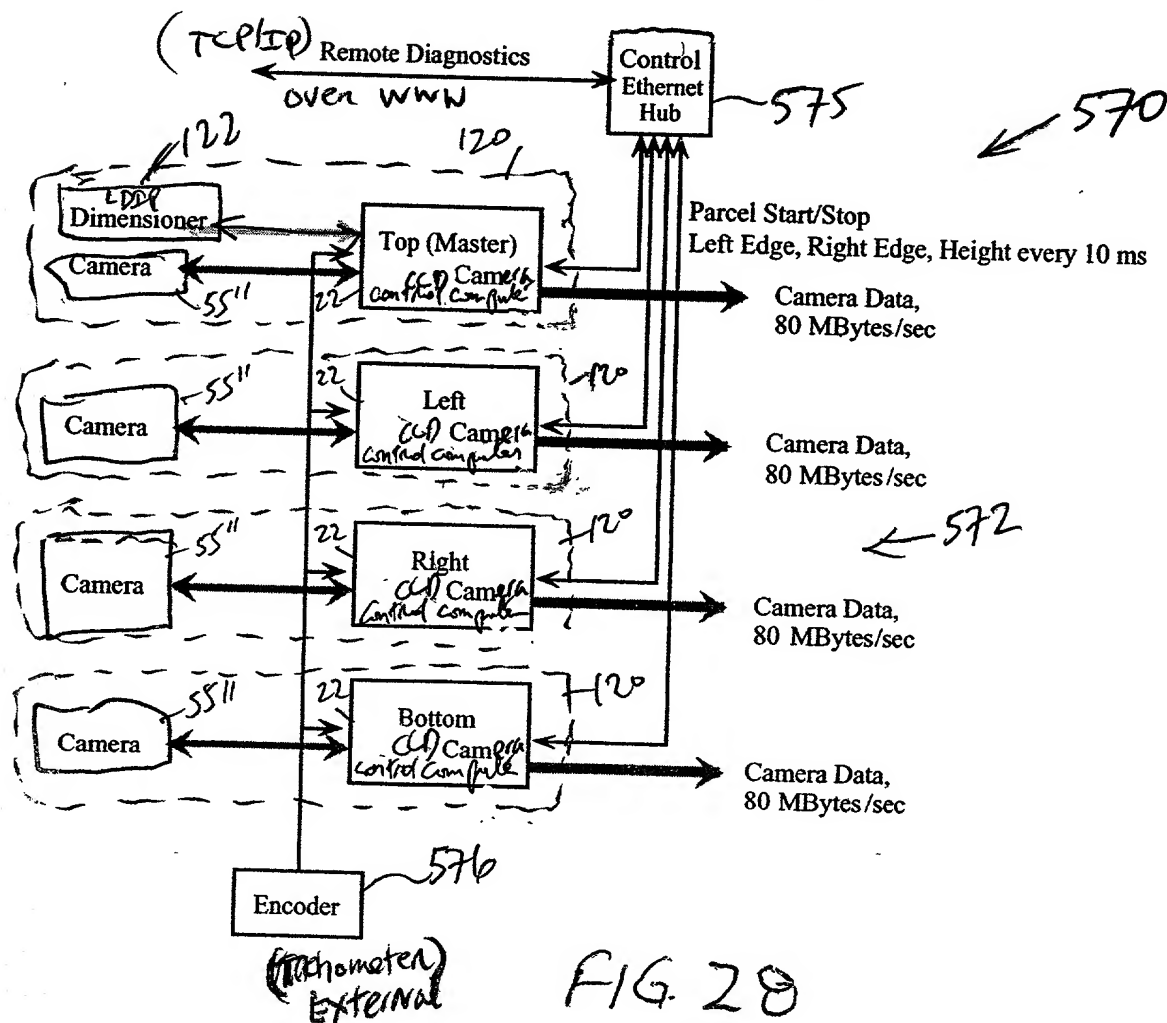
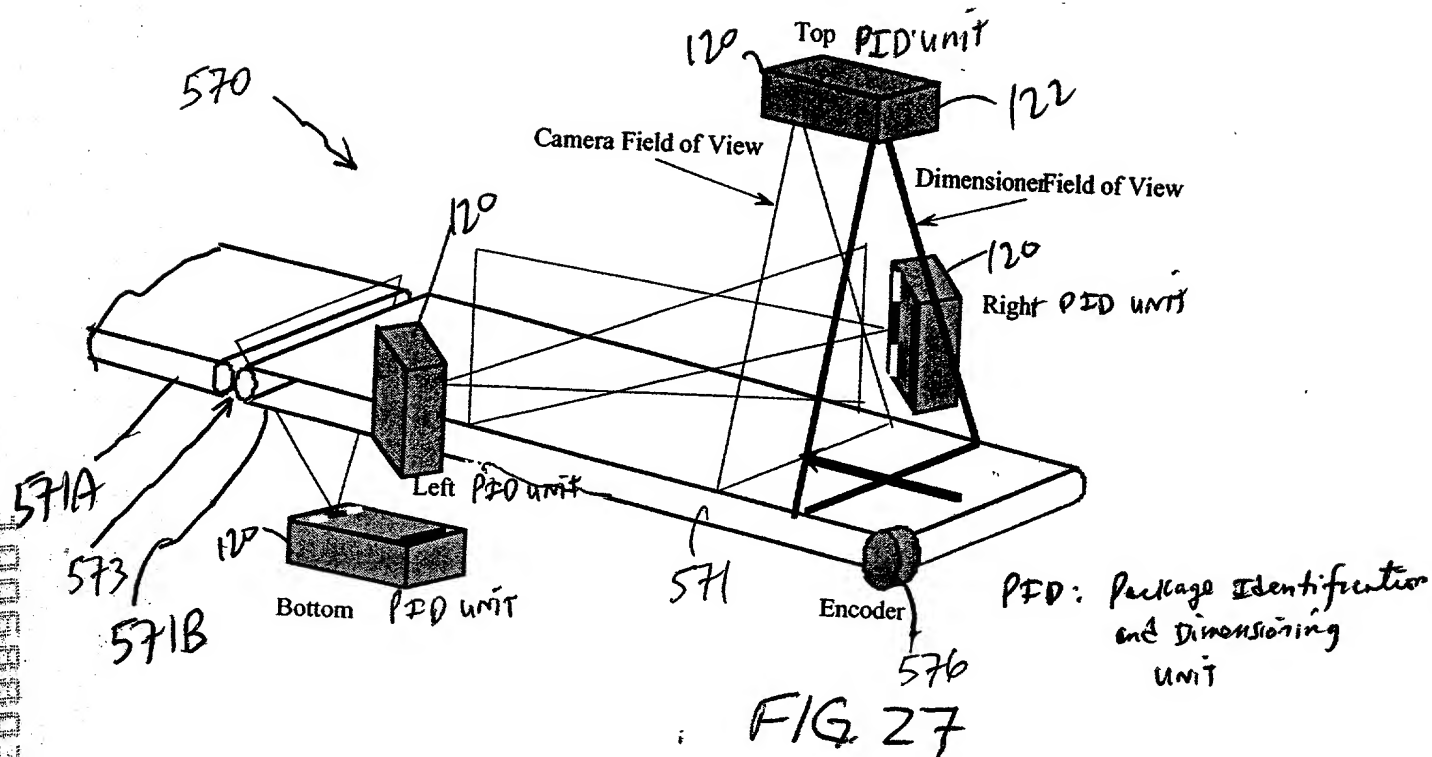


FIG. 26



10068003-0206001

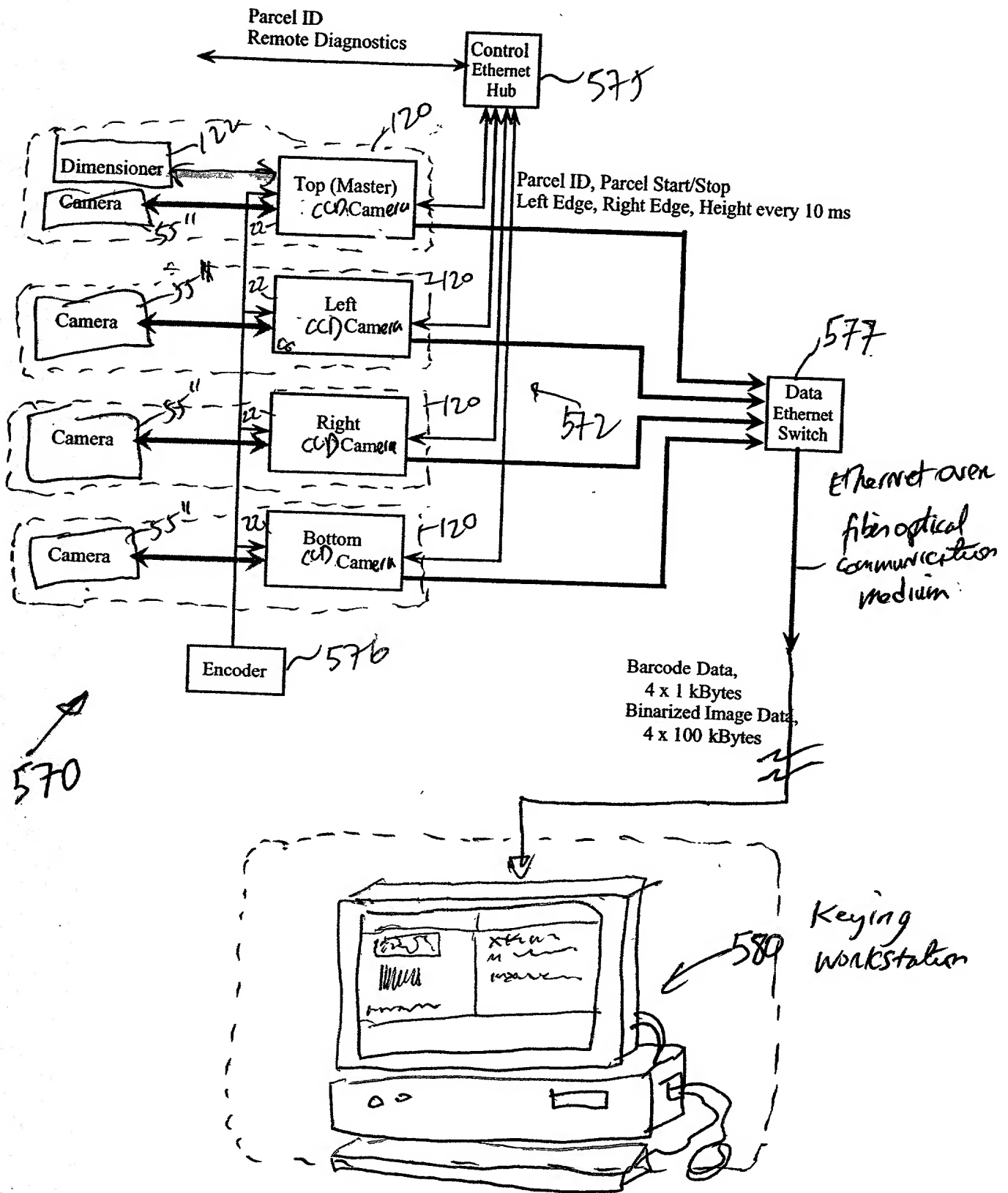
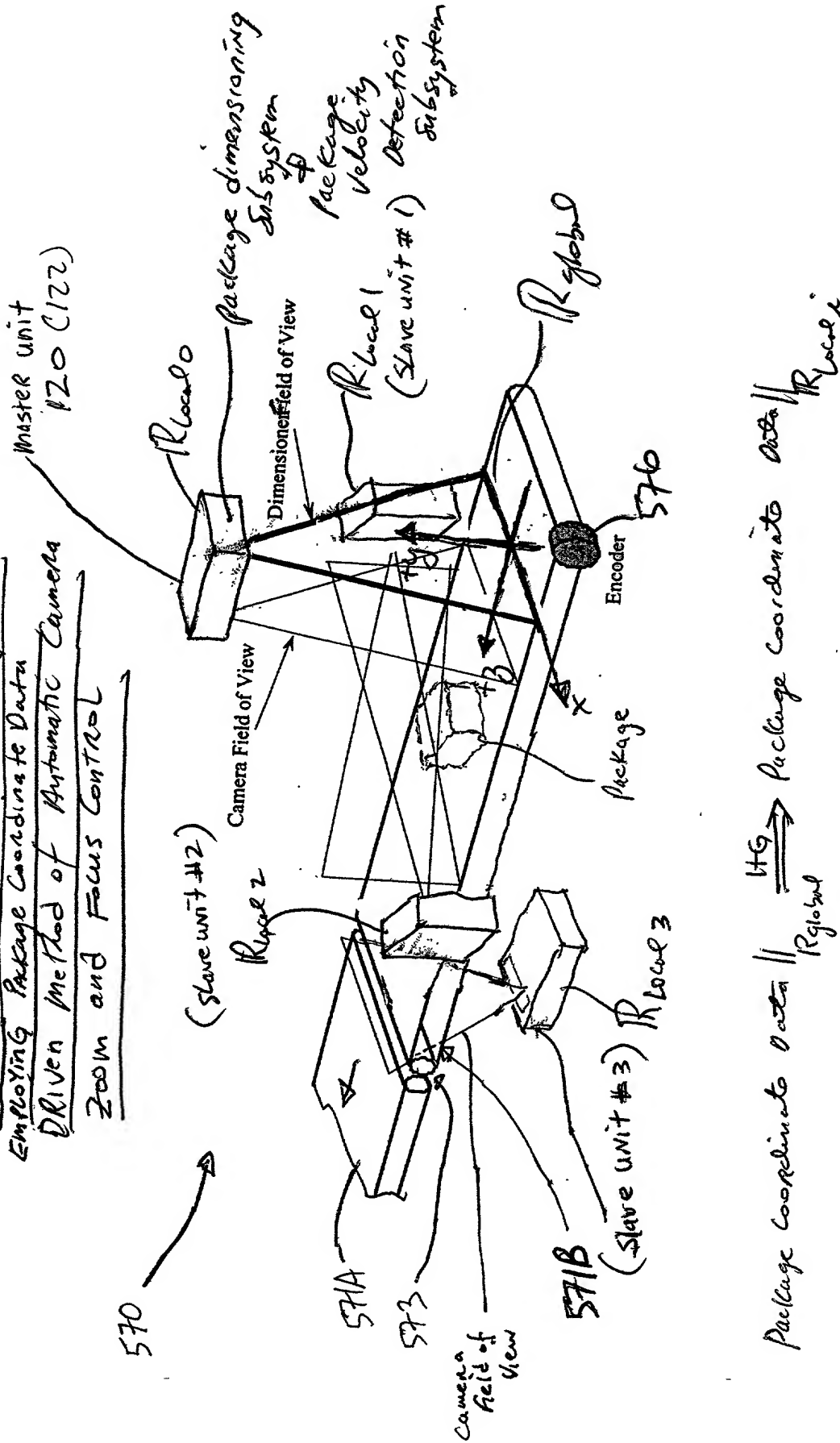


FIG. 29



Coordinate
Data
Referenced
with
respect to
 R_{global}

CCD Camera-Based Tunnel System Employing Package Coordinate Data Driven Method of Automatic Camera Zoom and Focus Control



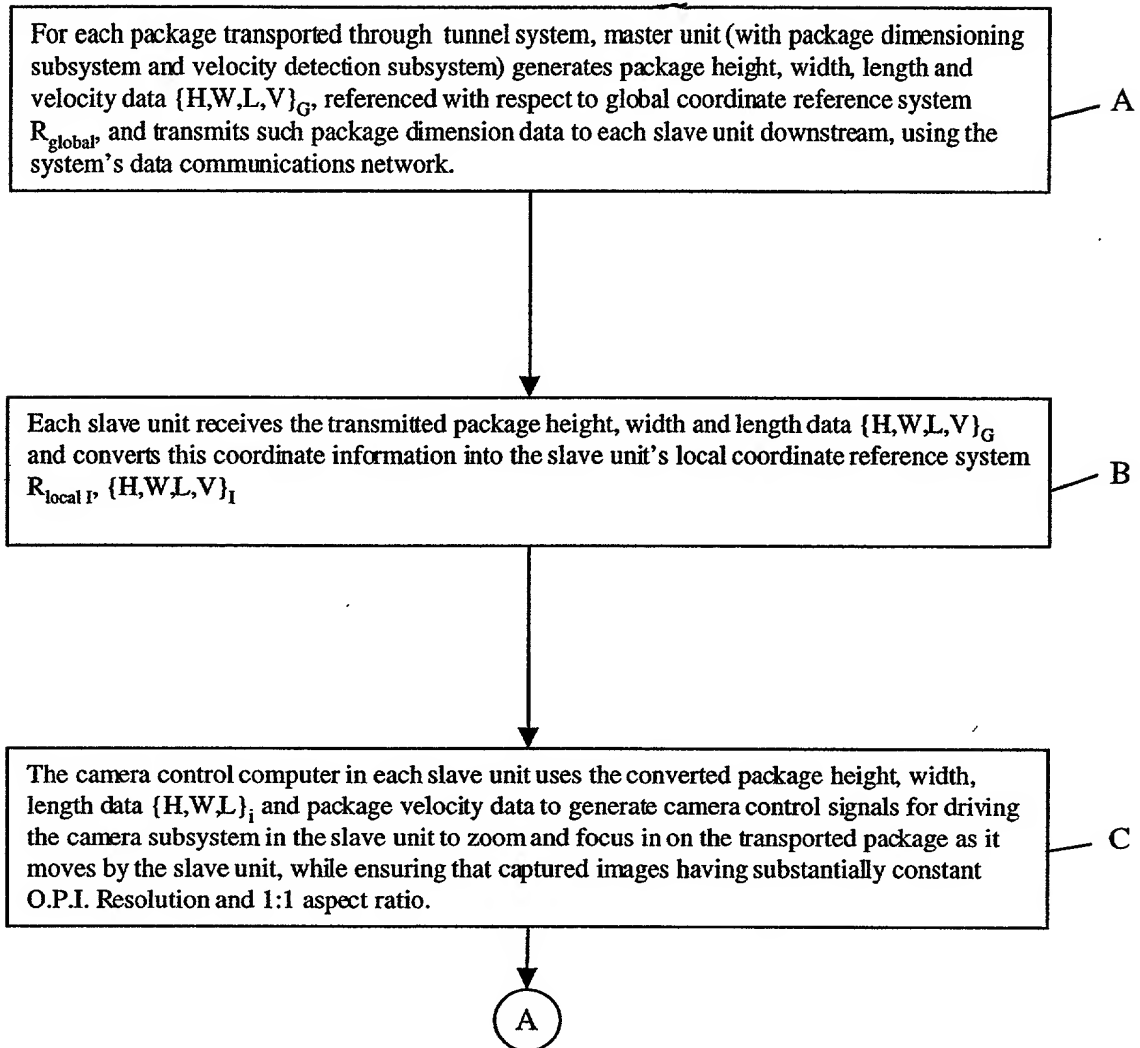


FIG. 32A



Each slave unit captures images acquired by its intelligently controlled camera subsystem, buffers the same, and processes the images to decode bar code symbol identifiers represented in said images, and/or to perform optical character recognition (OCR) thereupon.

D

The slave unit which decodes a bar code symbol in a processed image automatically transmits a package identification data element (containing symbol character data representative of the decoded bar code symbol) to the master unit (or other designated system control unit employing data element management functionalities) for package data element processing.

E

Master unit time-stamps received package identification data element, places said data element in a data queue, and processes package identification data elements and time-stamped package dimension data elements in said queue to link each package identification data element with one said corresponding package dimension data element.

F

FIG. 32B

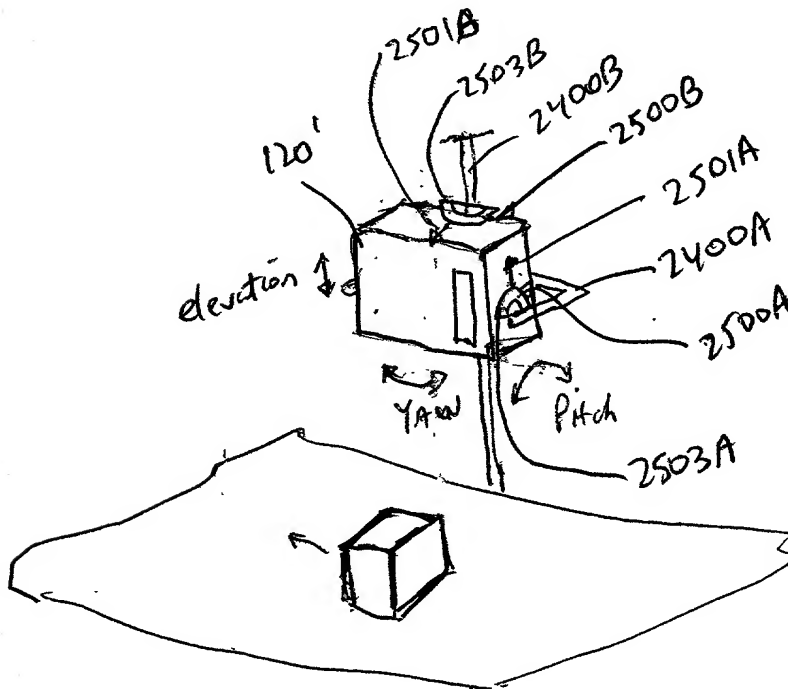
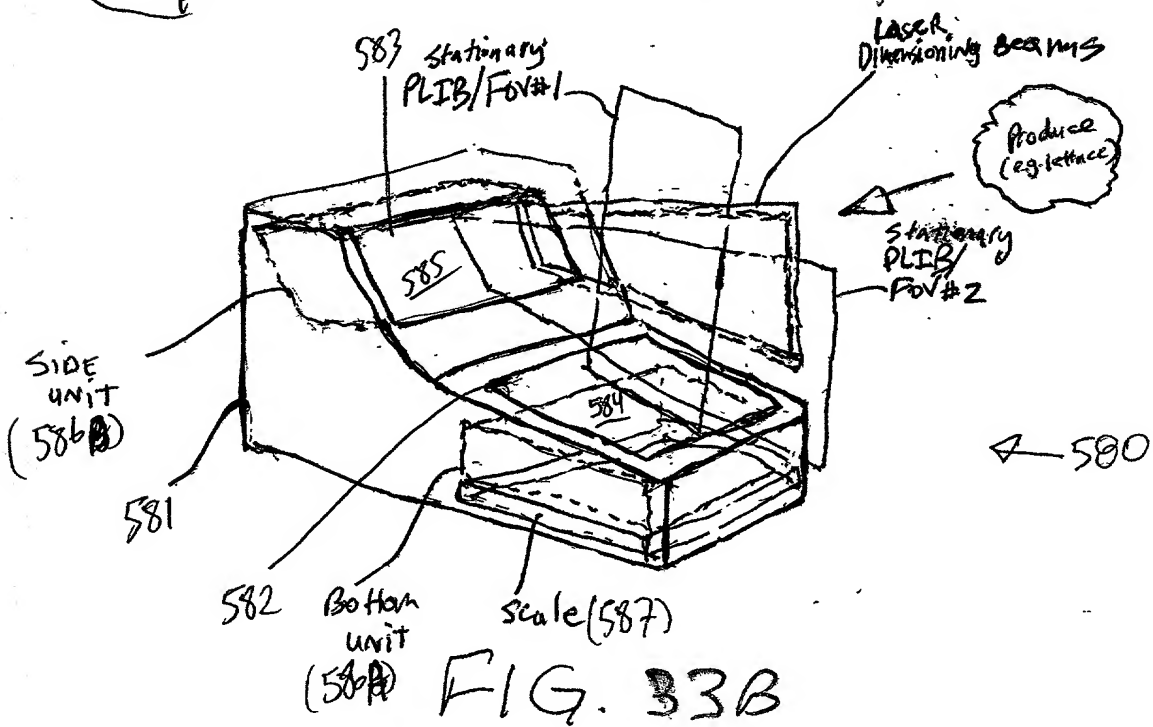
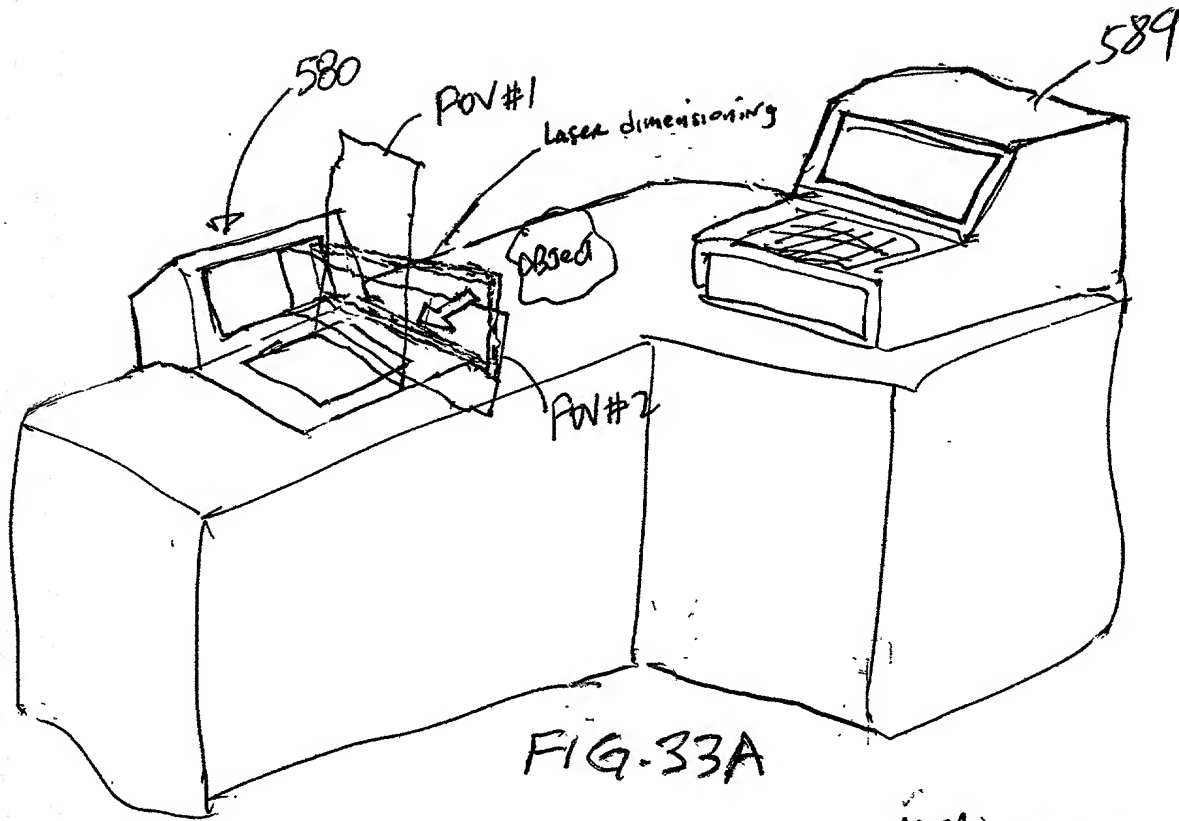


FIG. 31A

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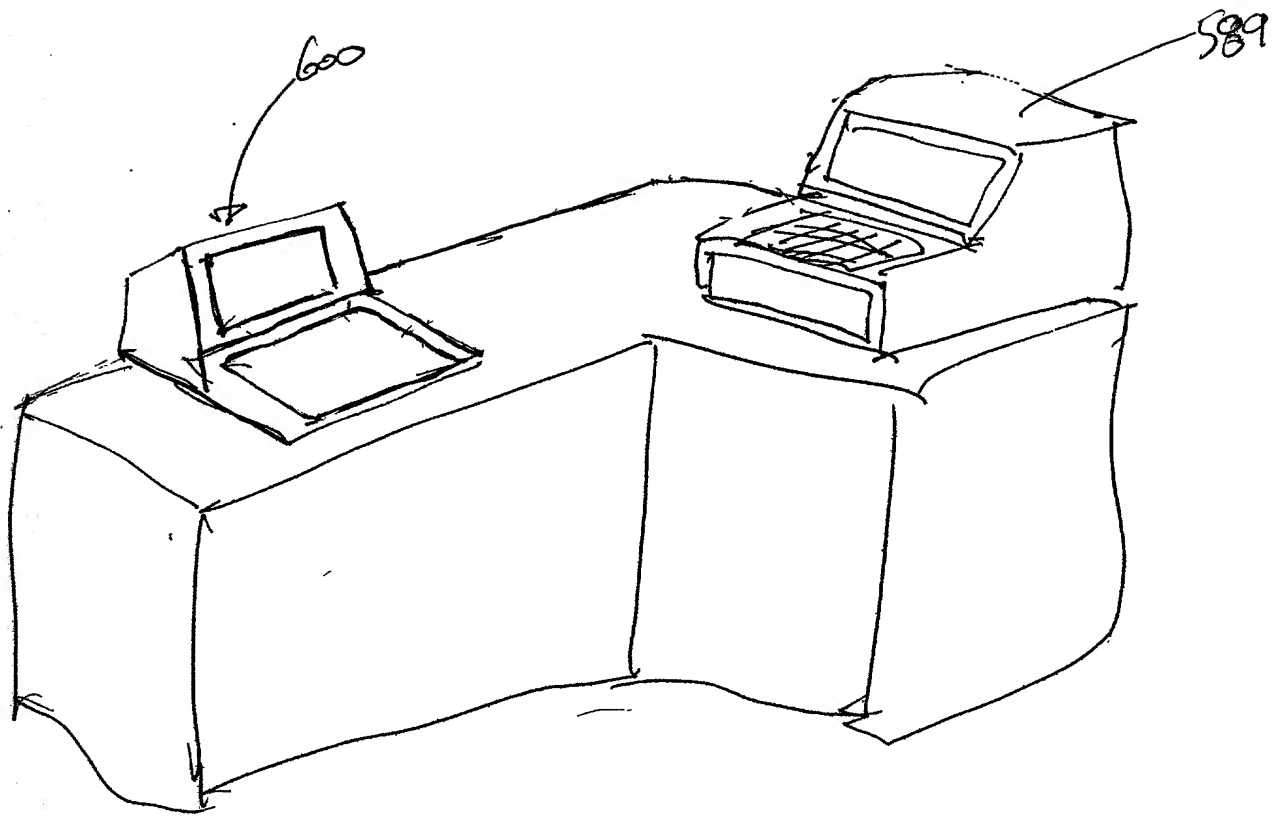


FIG. 34A

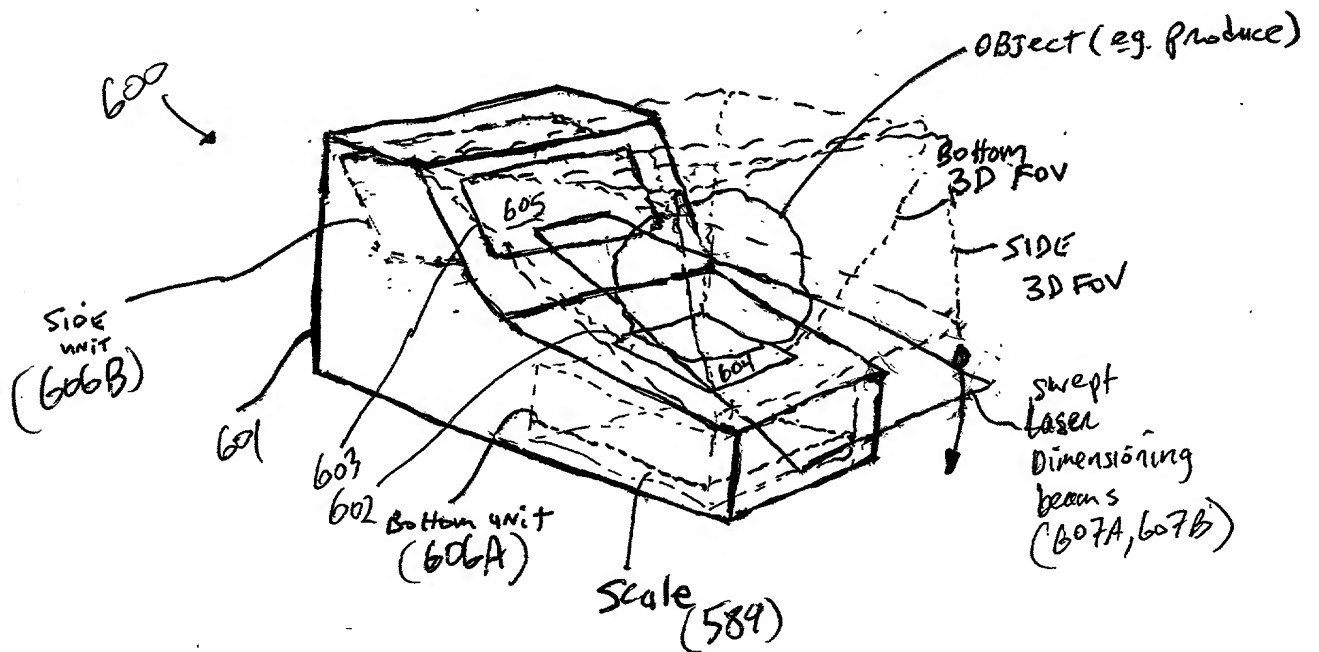


FIG. 34B

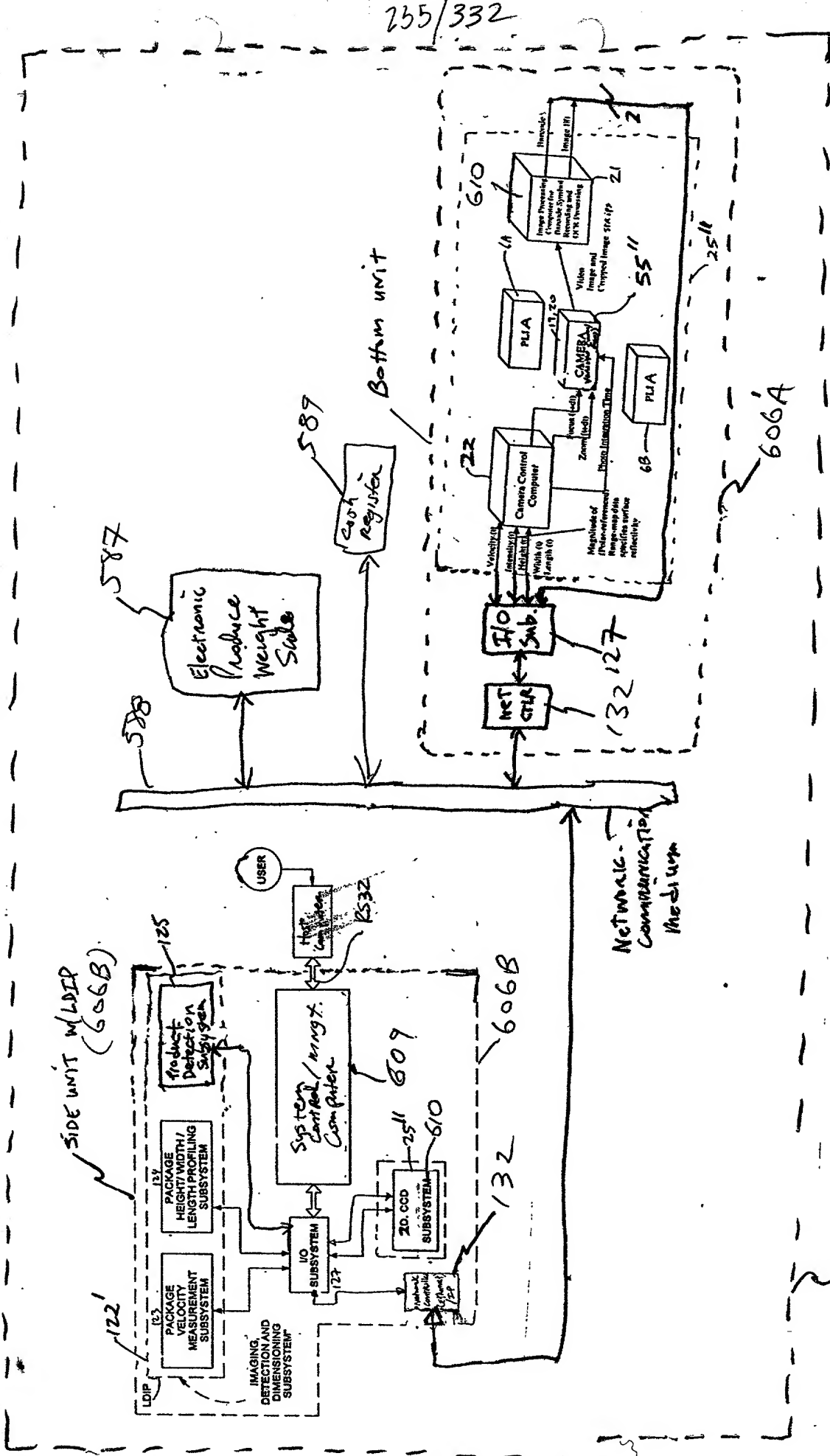
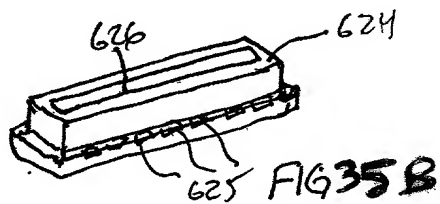
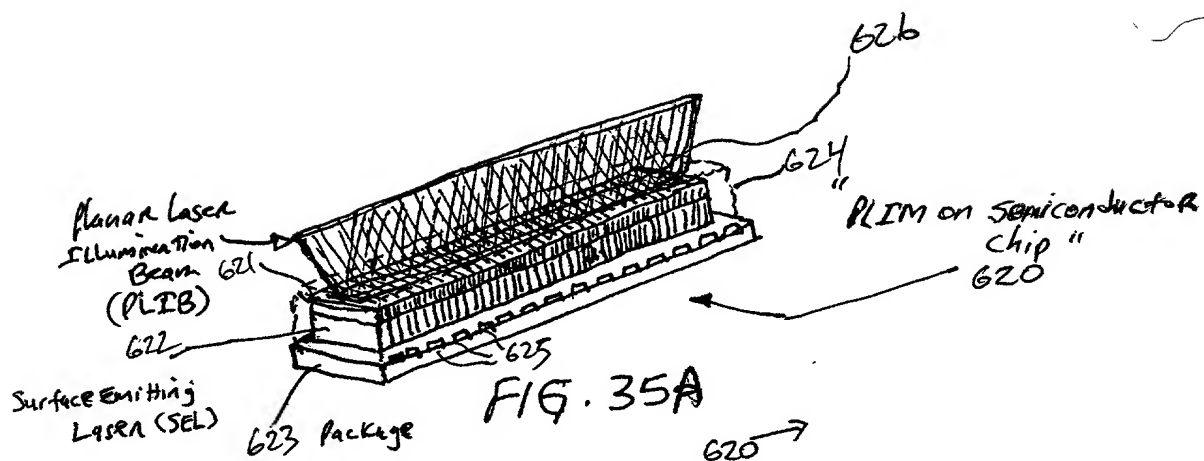


FIG 34C

600



10060003-0205002

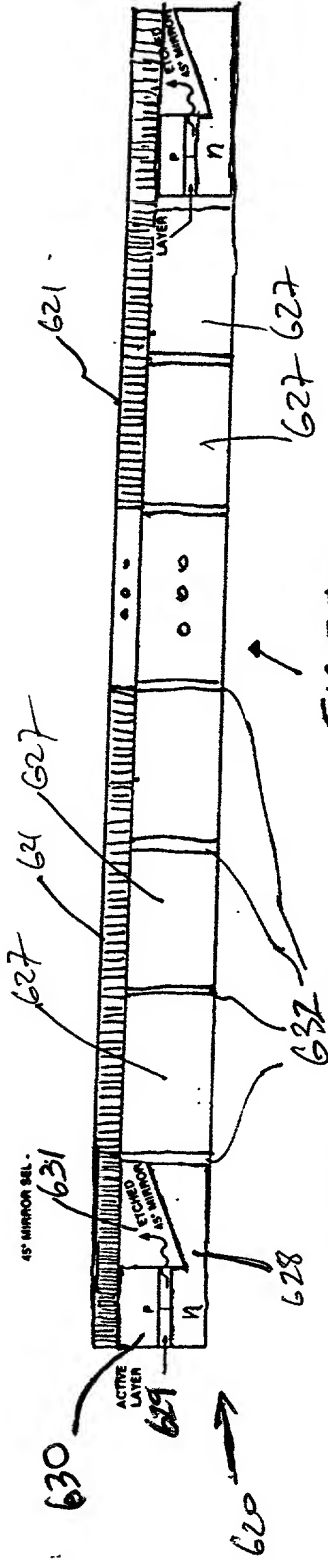


FIG. 36A

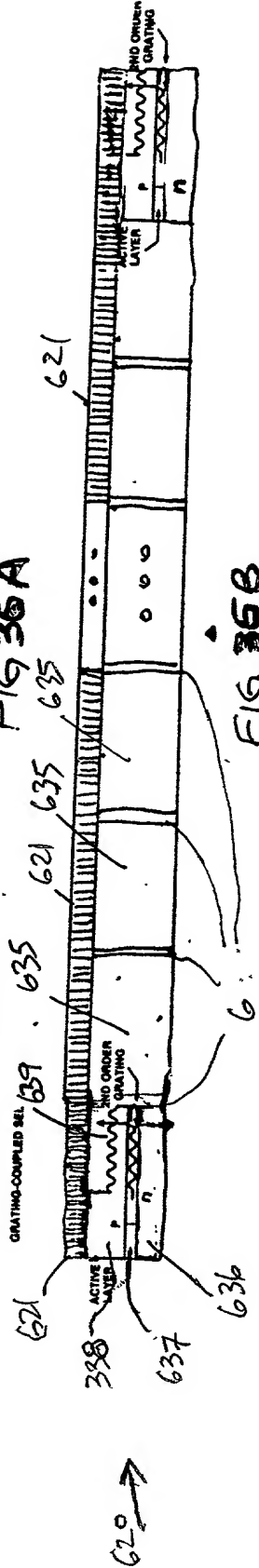


FIG. 36B

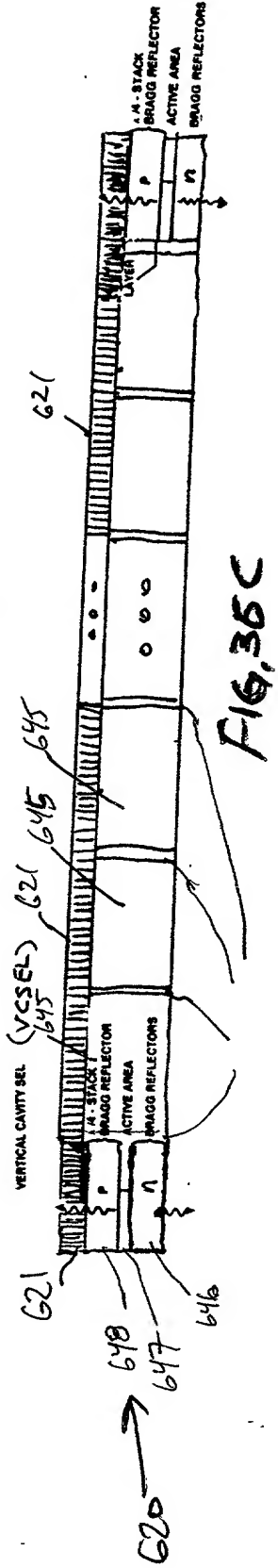


FIG. 36C

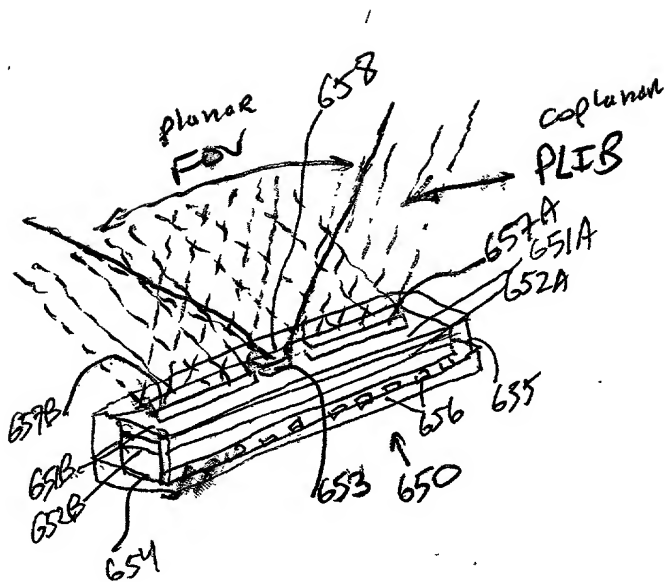


FIG. 37

360

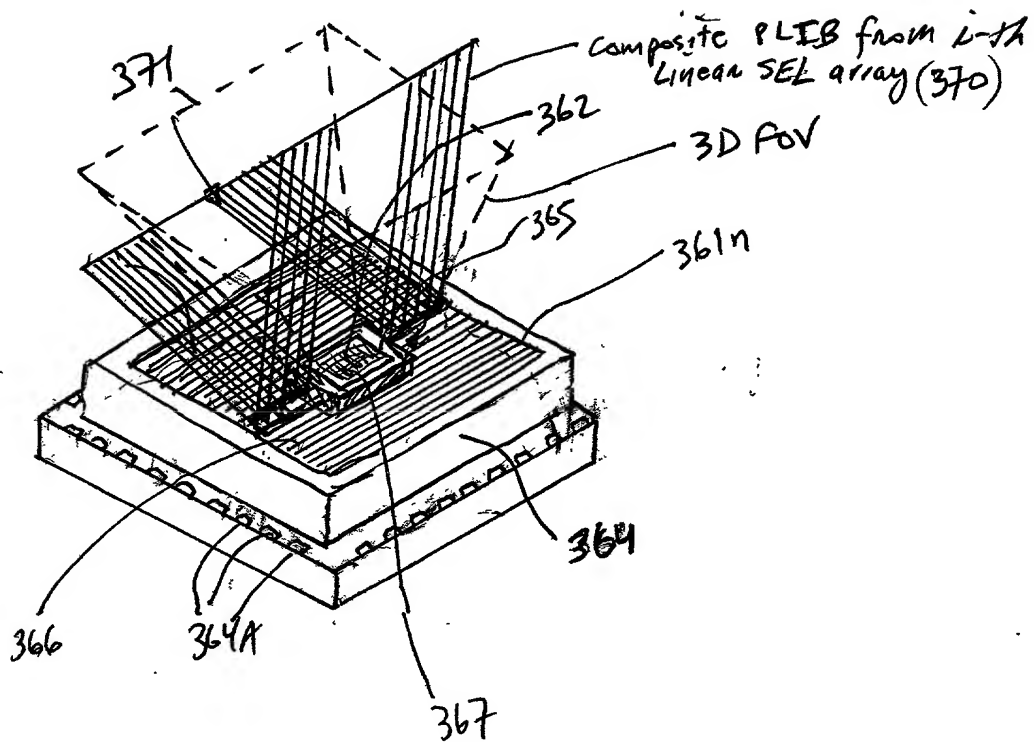


FIG. 38A

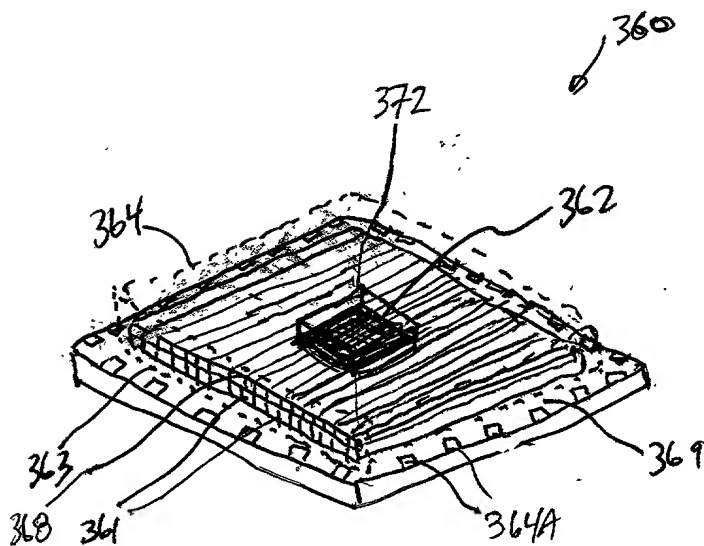


FIG. 38B

10058803, 020502

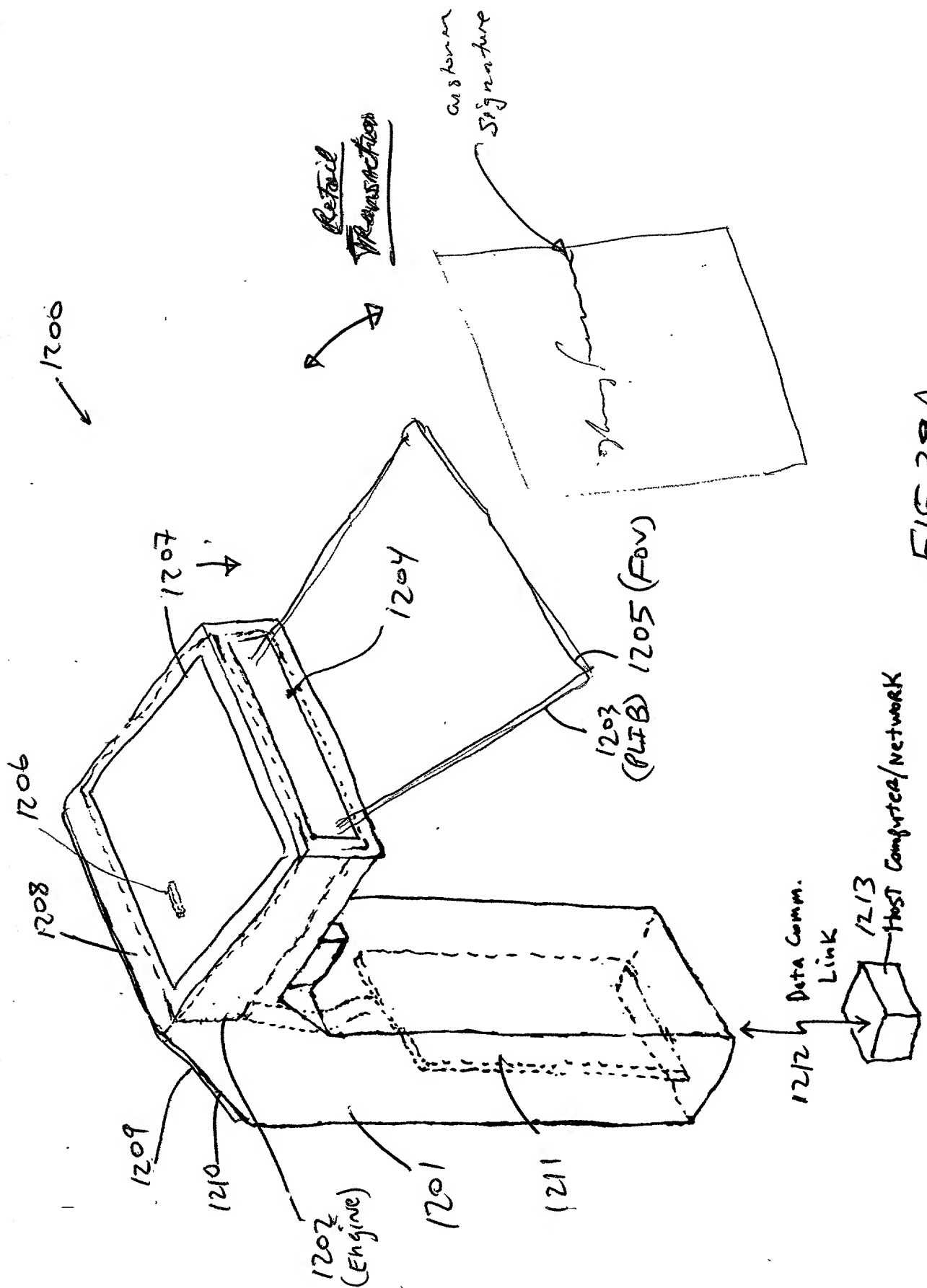


FIG. 39A

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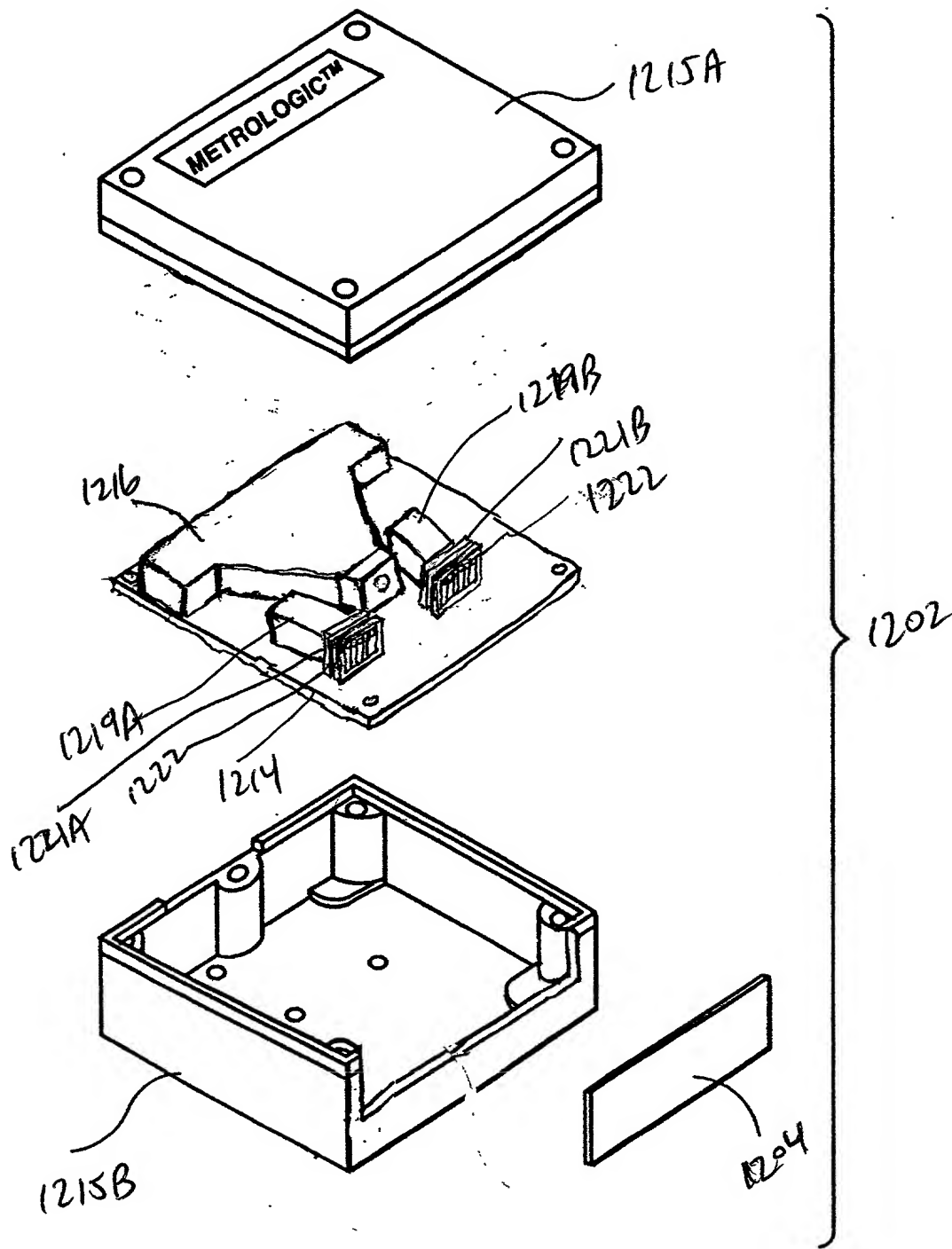


FIG. 39B

10068803-020602

10068803.020602

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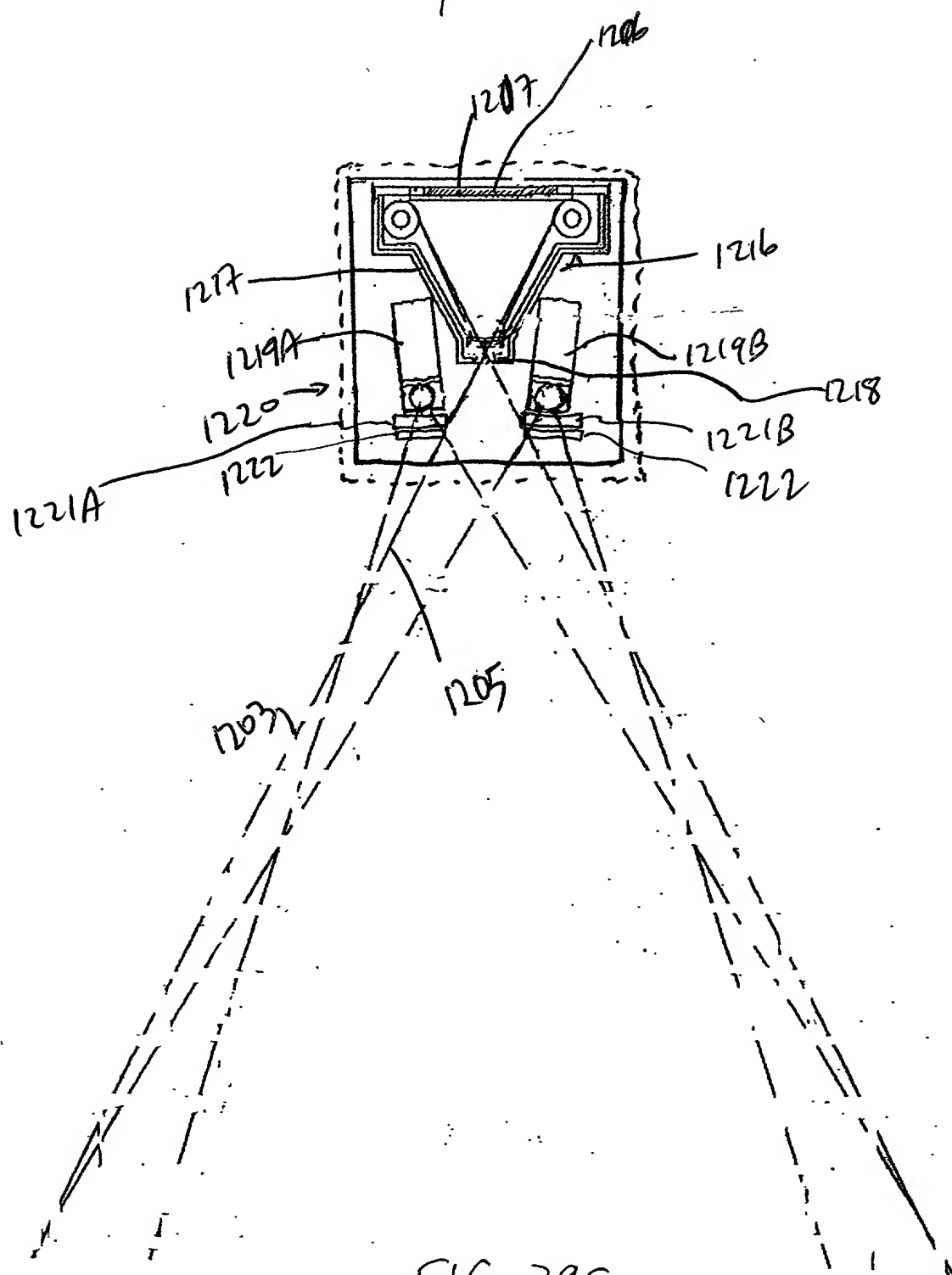


FIG. 39C

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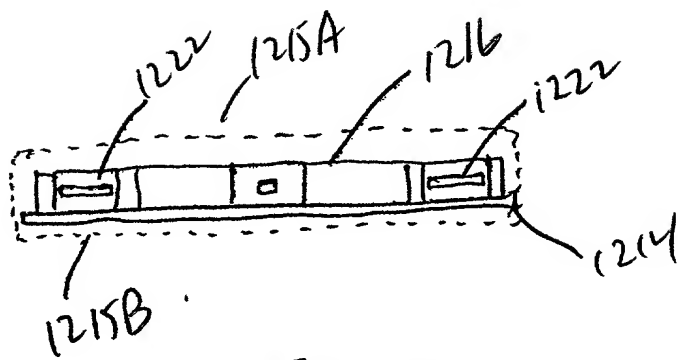


FIG. 39D

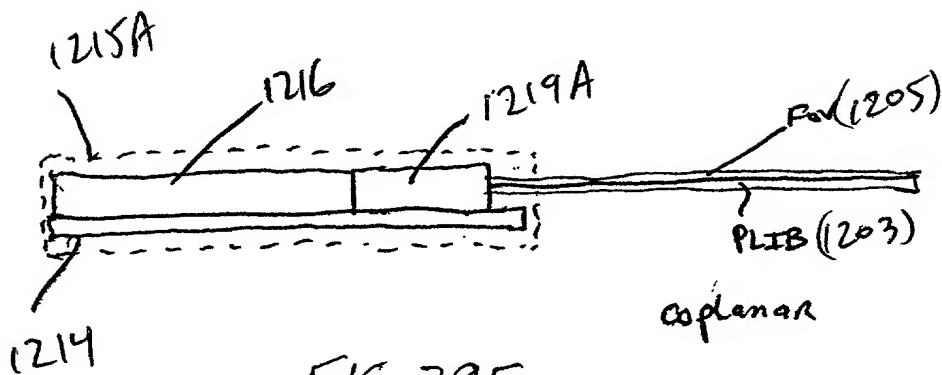


FIG. 39E

10068803-020602

FOR THE YEAR 1900

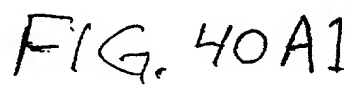
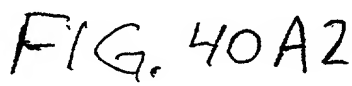
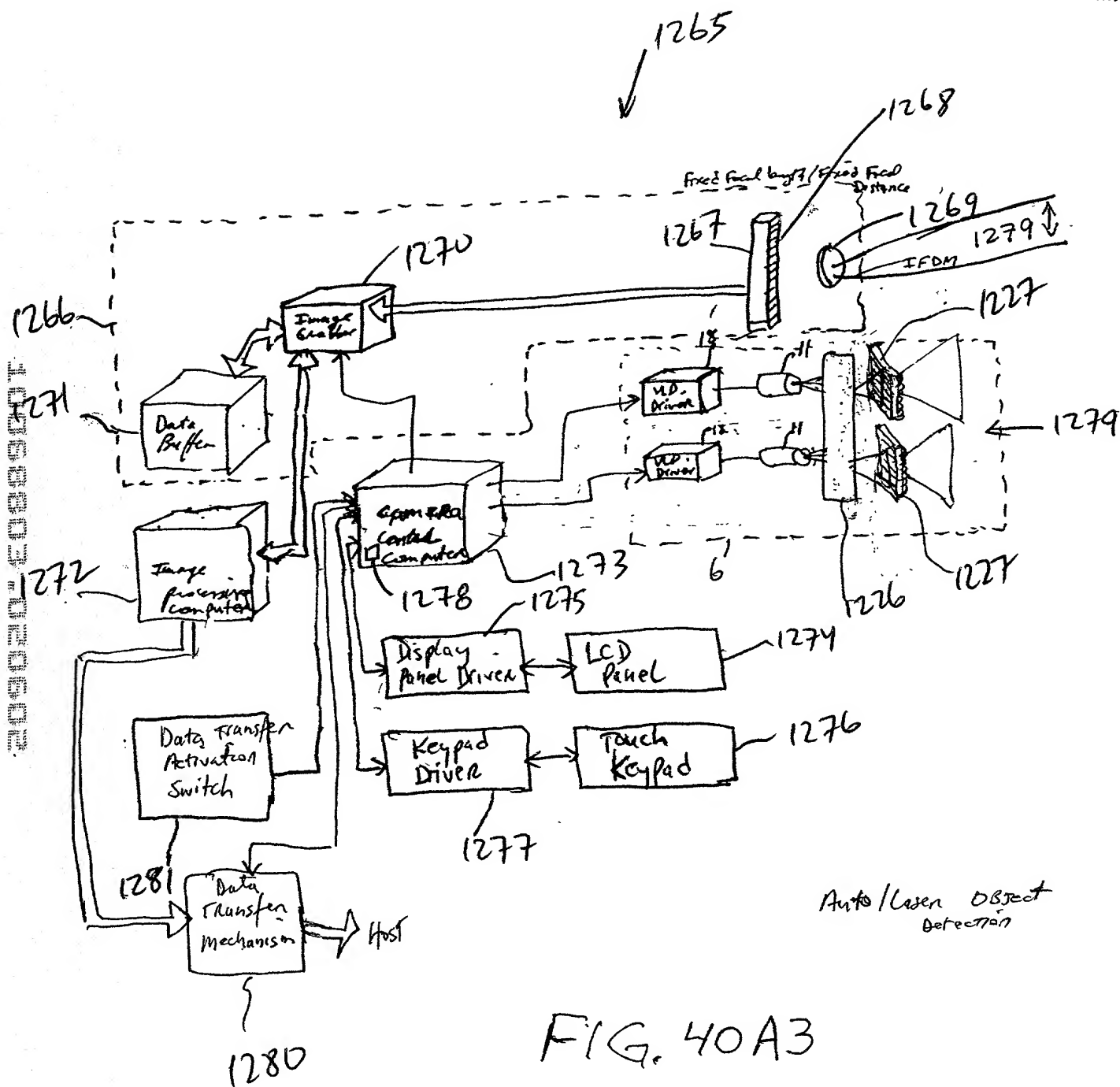


FIG. 40A1

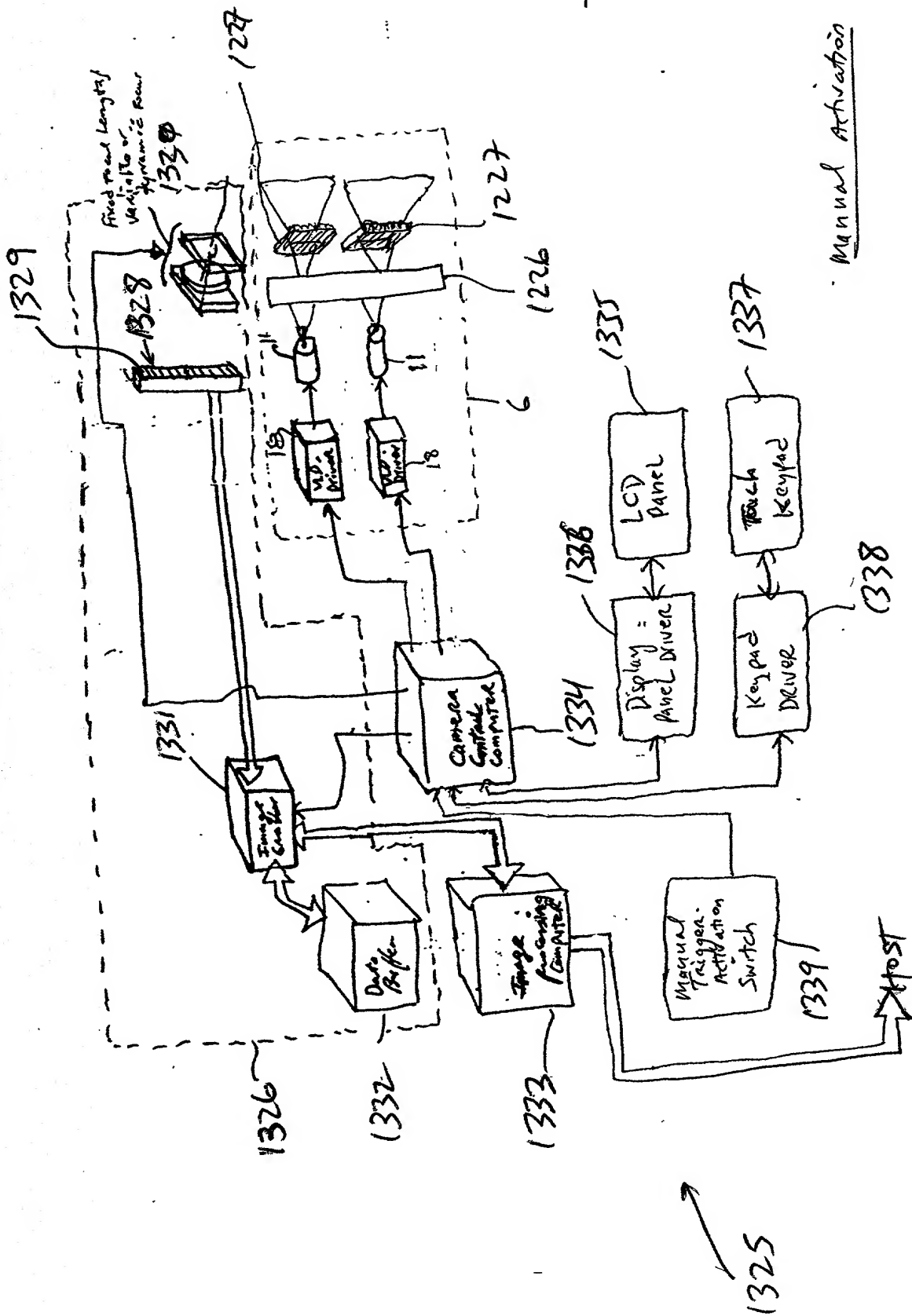
CONFIDENTIAL



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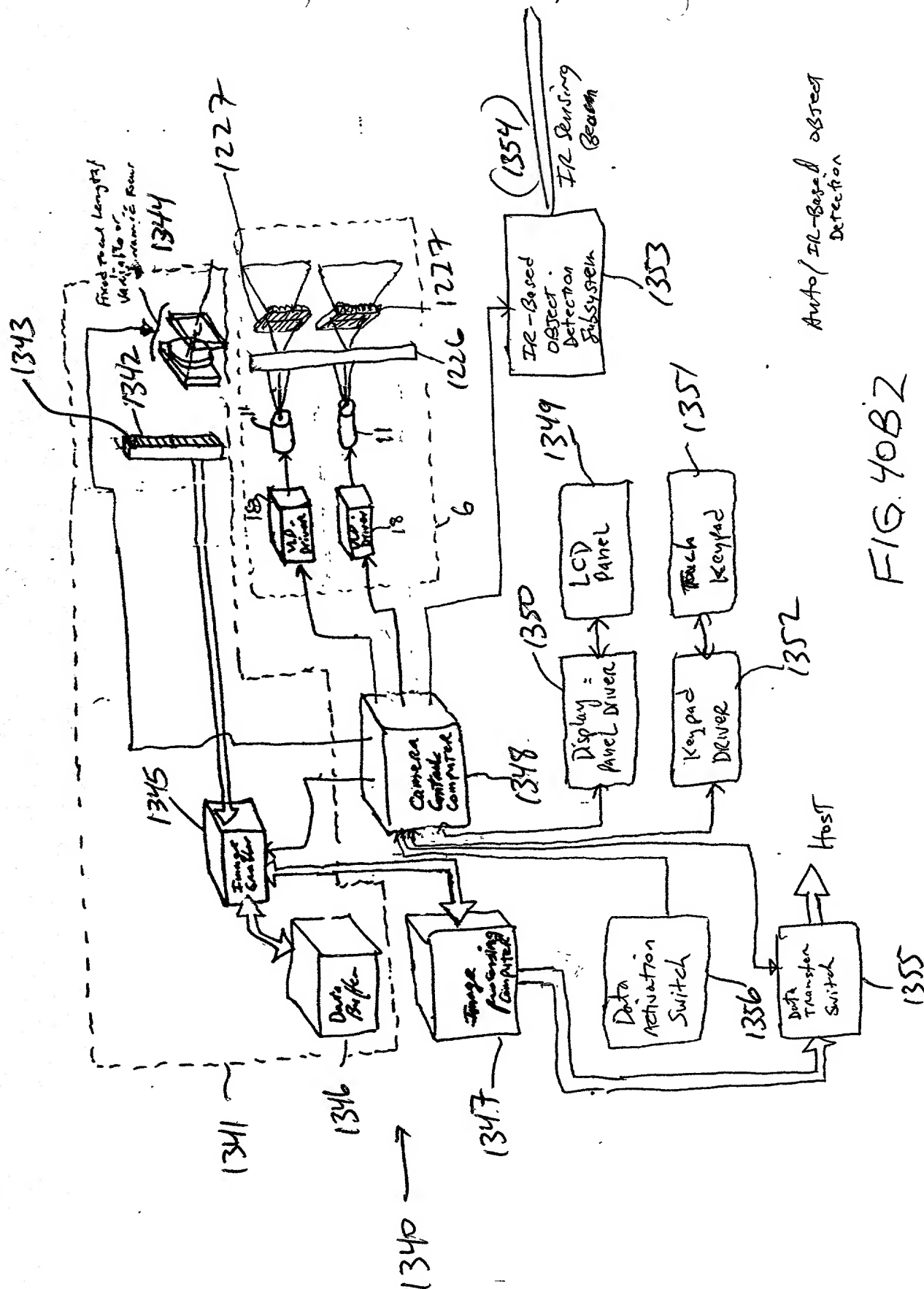
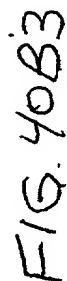


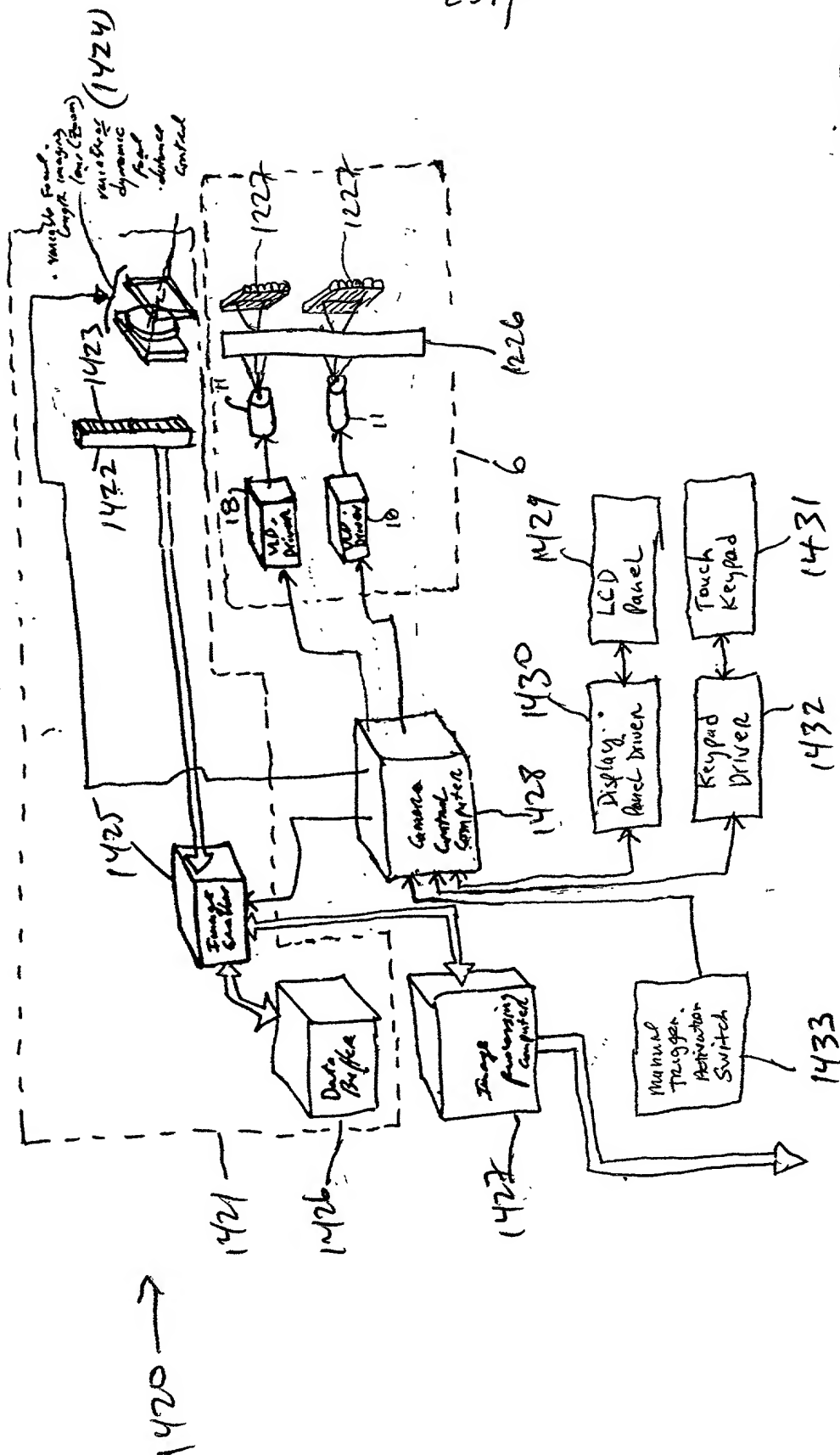
FIG. 40B2





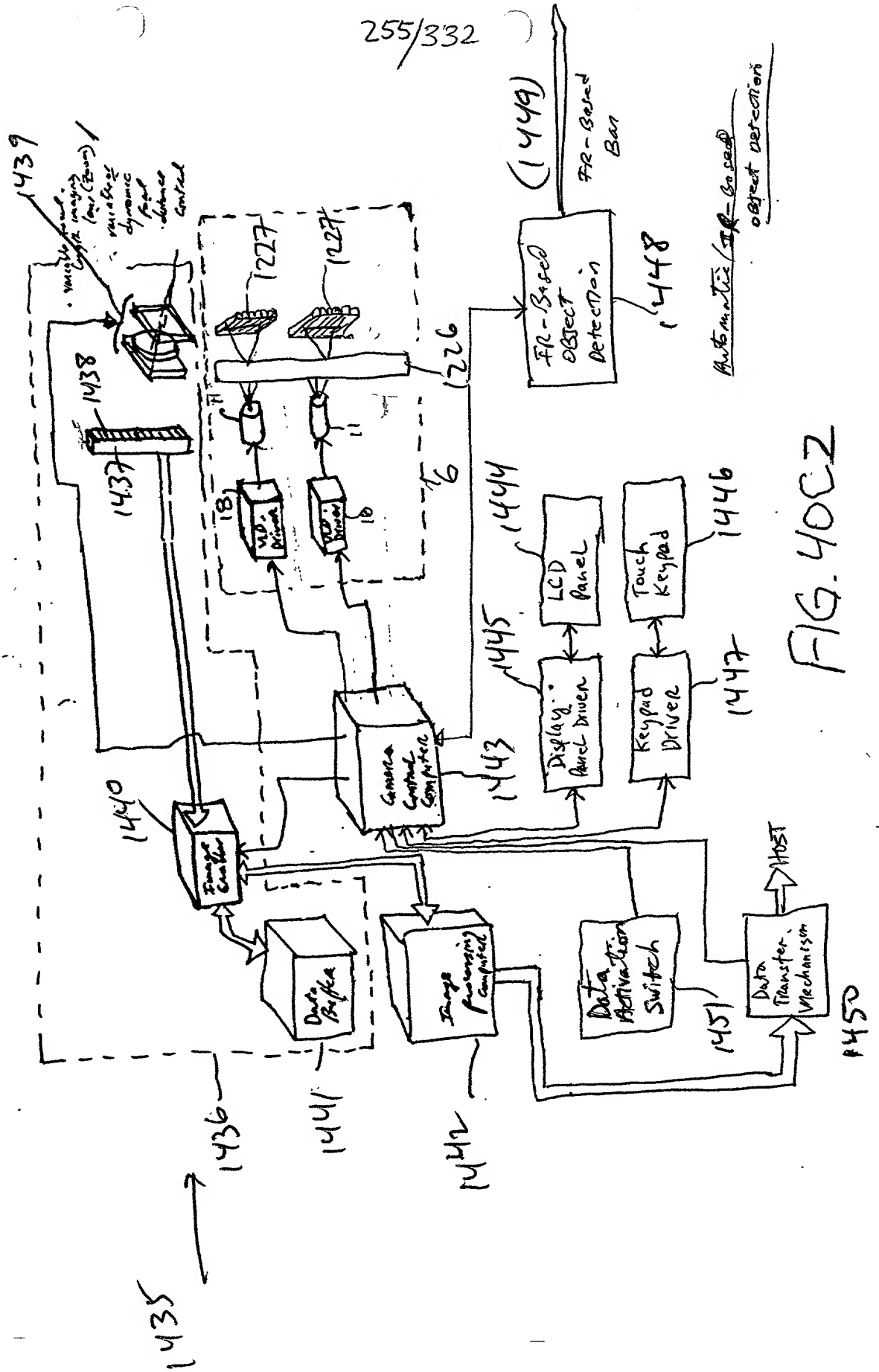
142

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Manual Activation

FIG. 40C1



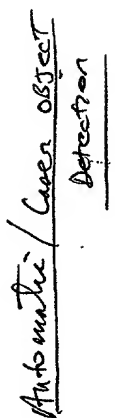


FIG. 40C3

[illegible]

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Automatic/BCP only
- No object protect

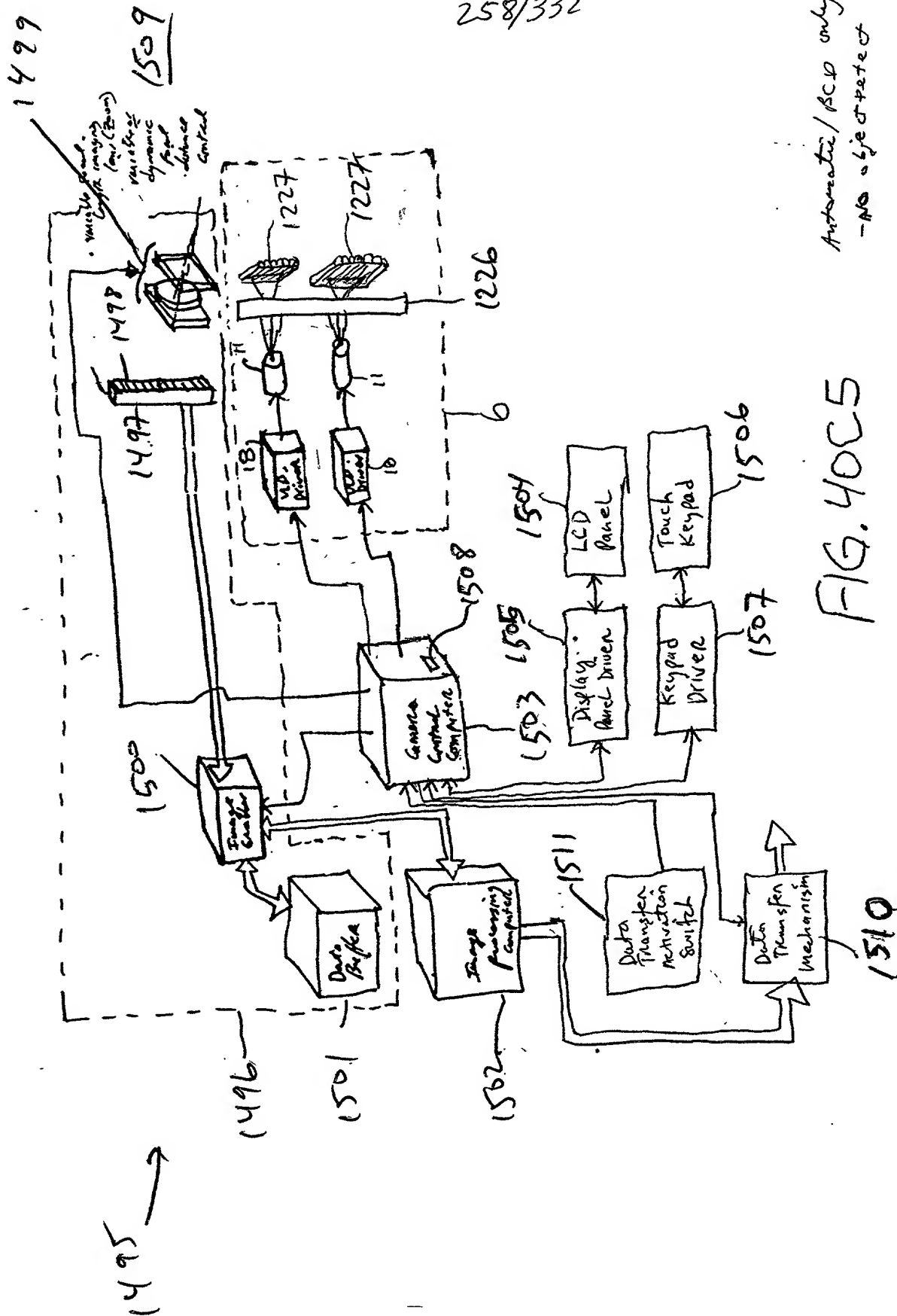
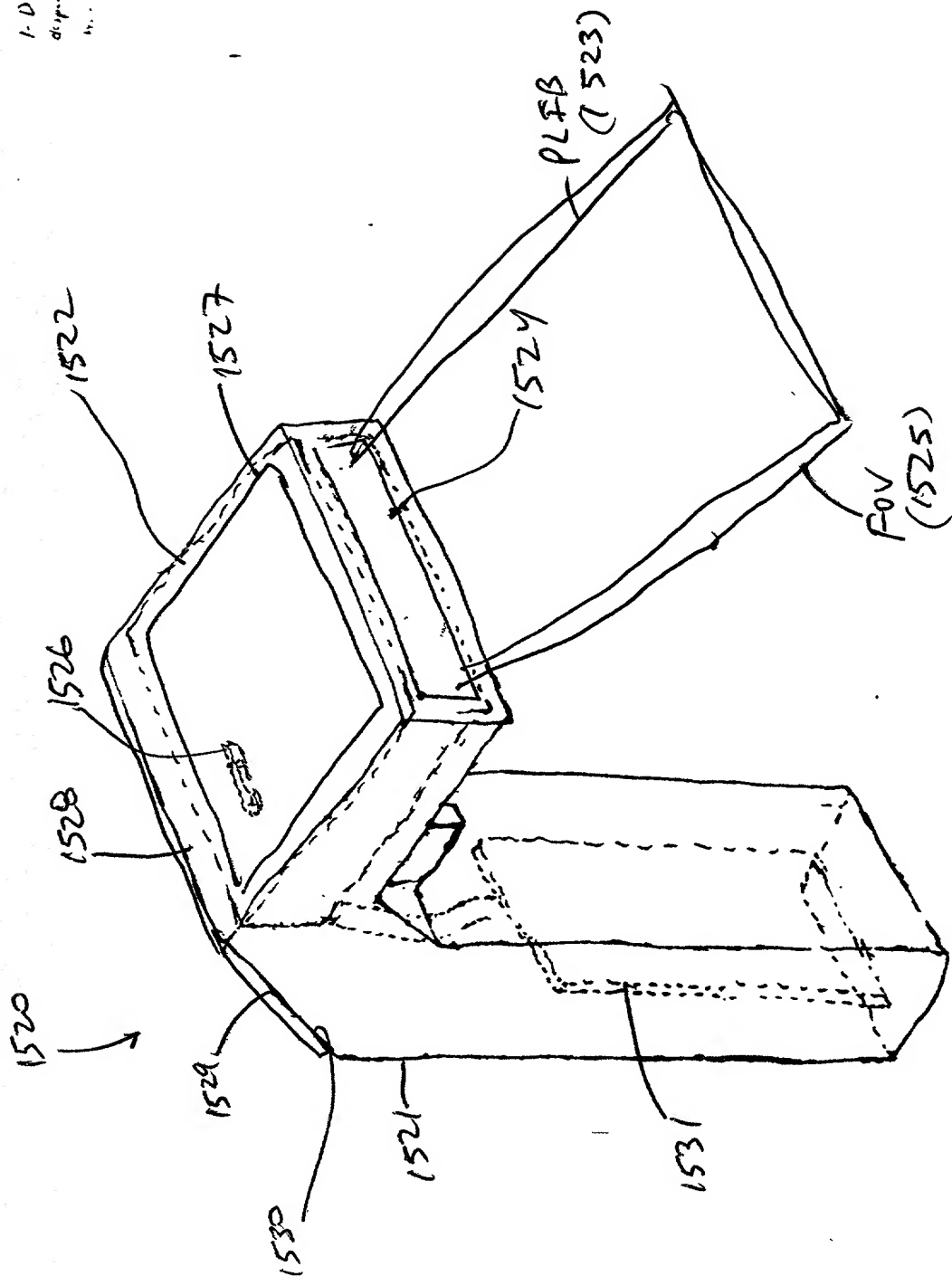
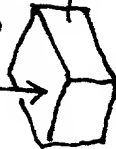


FIG. 40C5

1-D
display



Data Comm.
Link



Host Computer/Network

FIG. 41A

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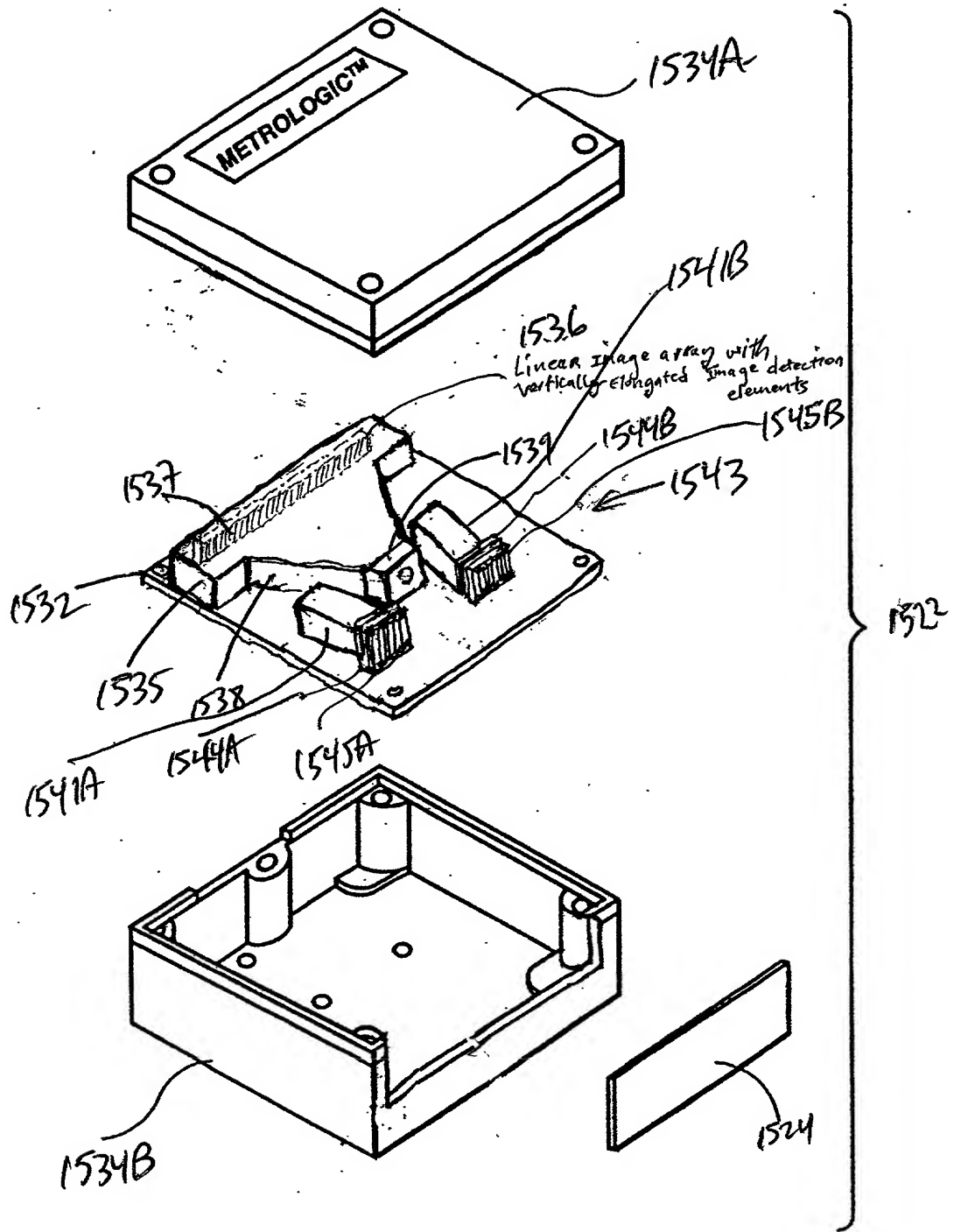


FIG. 41B

2090210-00889001

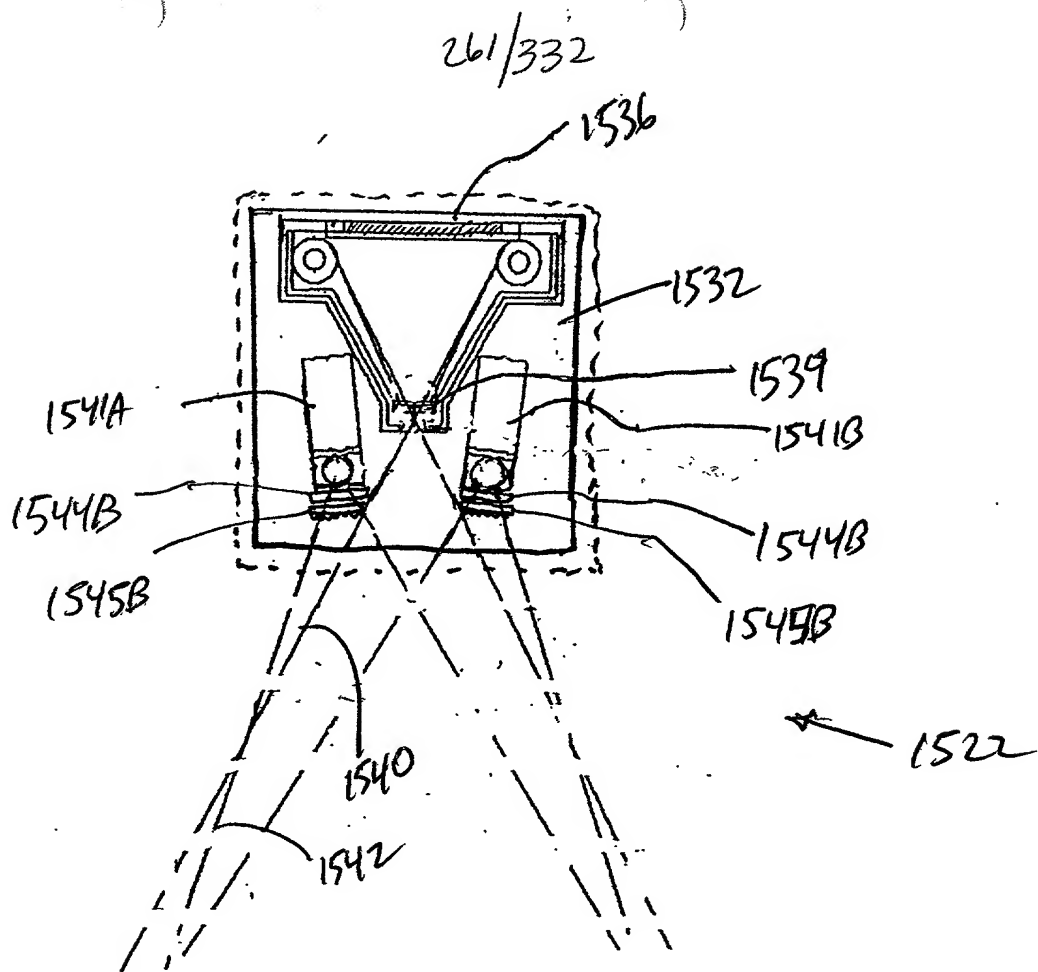


FIG. 41C

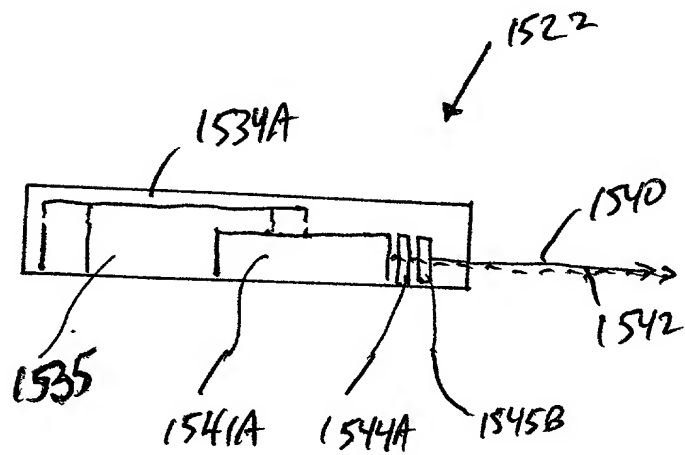


FIG. 41D

1-1

FIG. 42A

FIG. 42A

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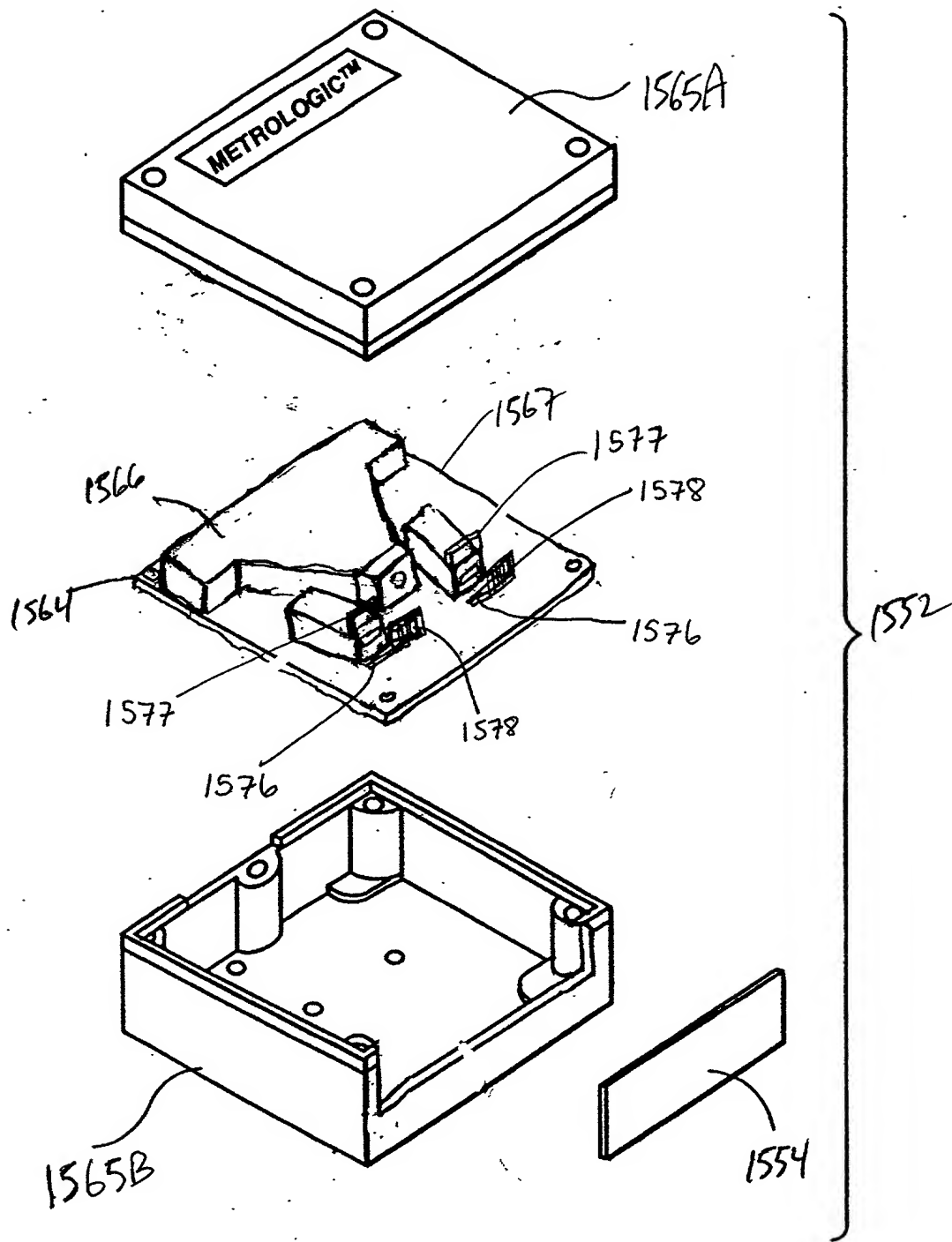


FIG. 42B

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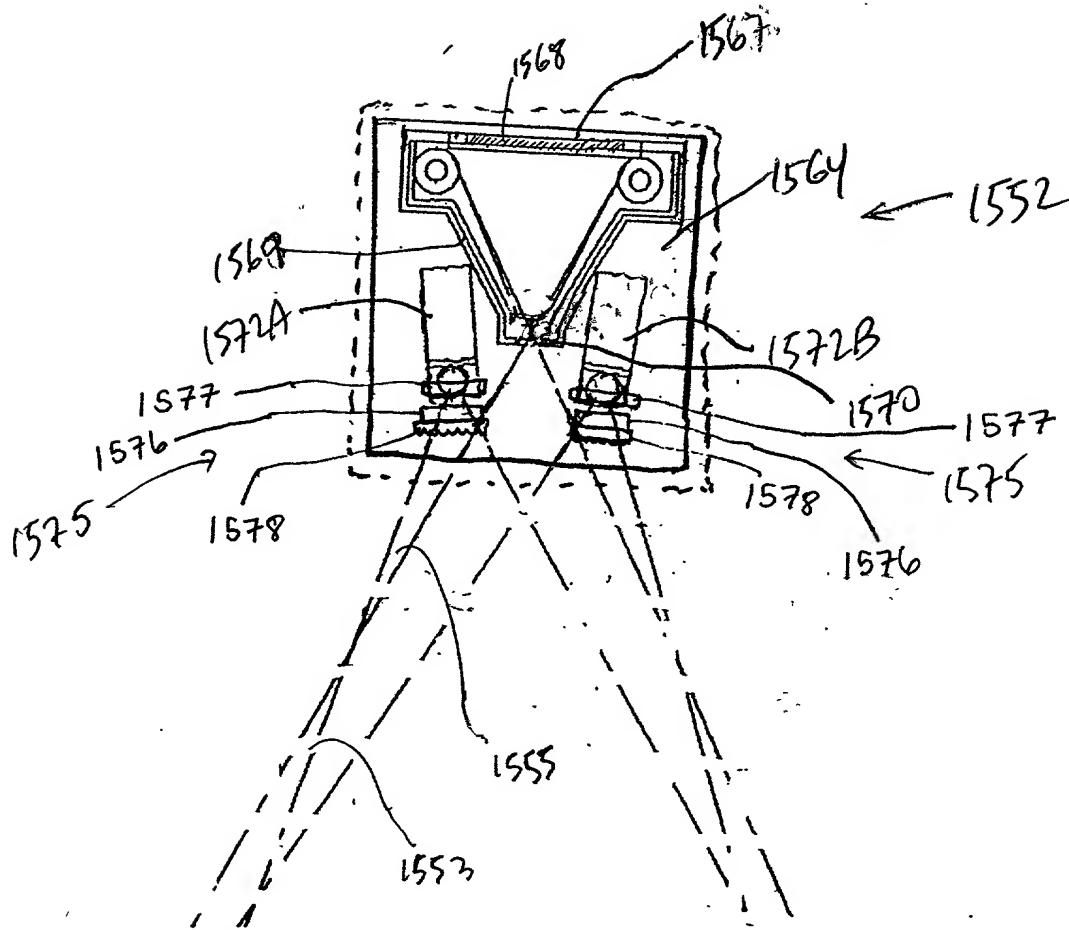


FIG. 42C

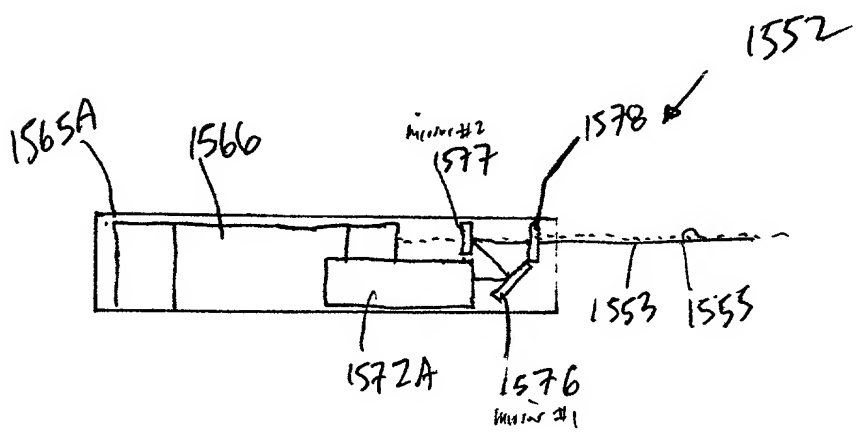


FIG. 42D

2009020" E088900T

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1-D
displacement
in ...

1580

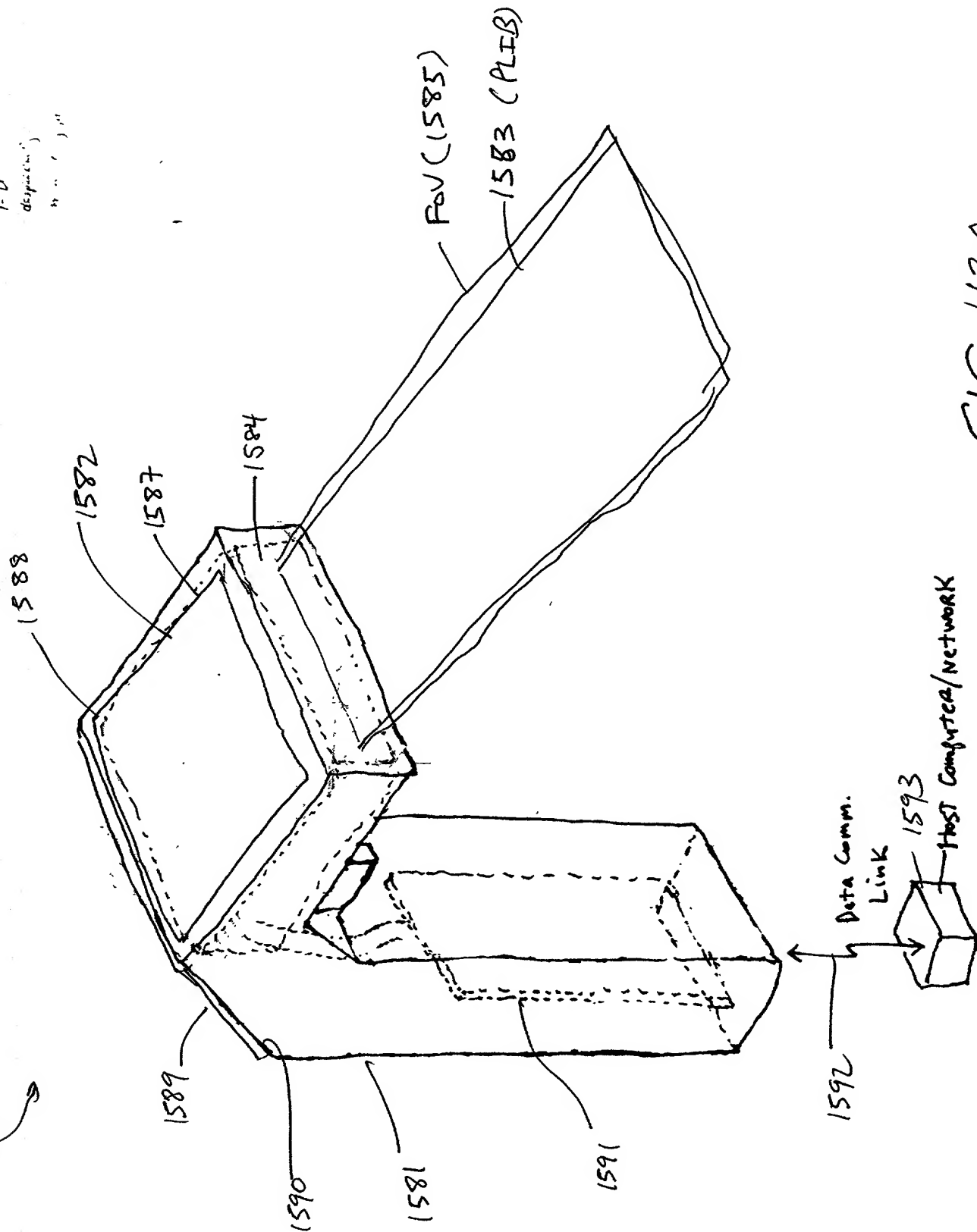
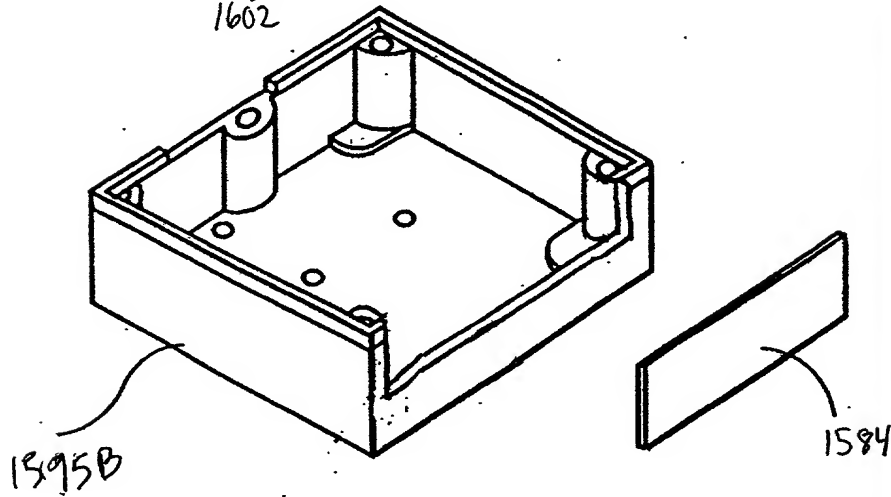
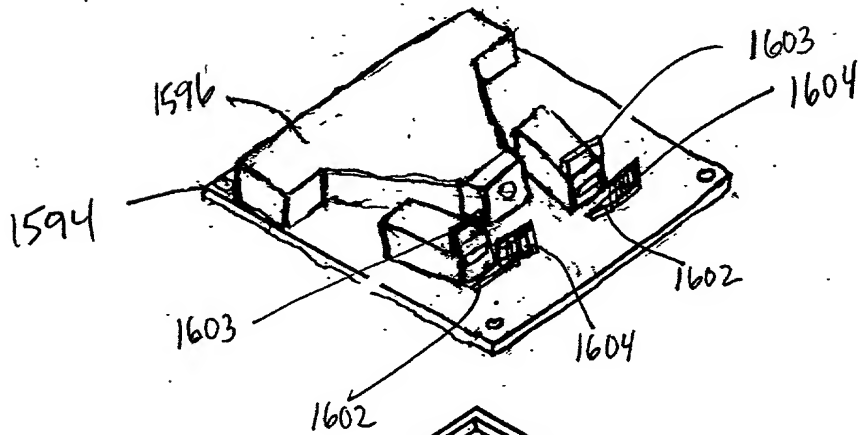
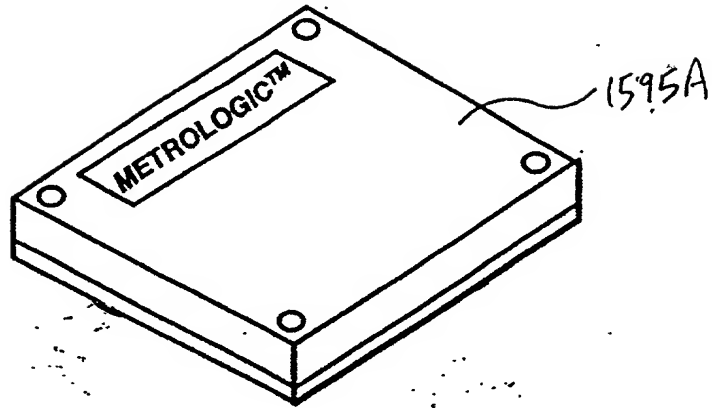


FIG. 43A

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1582

FIG. 43B

209078" 60899001

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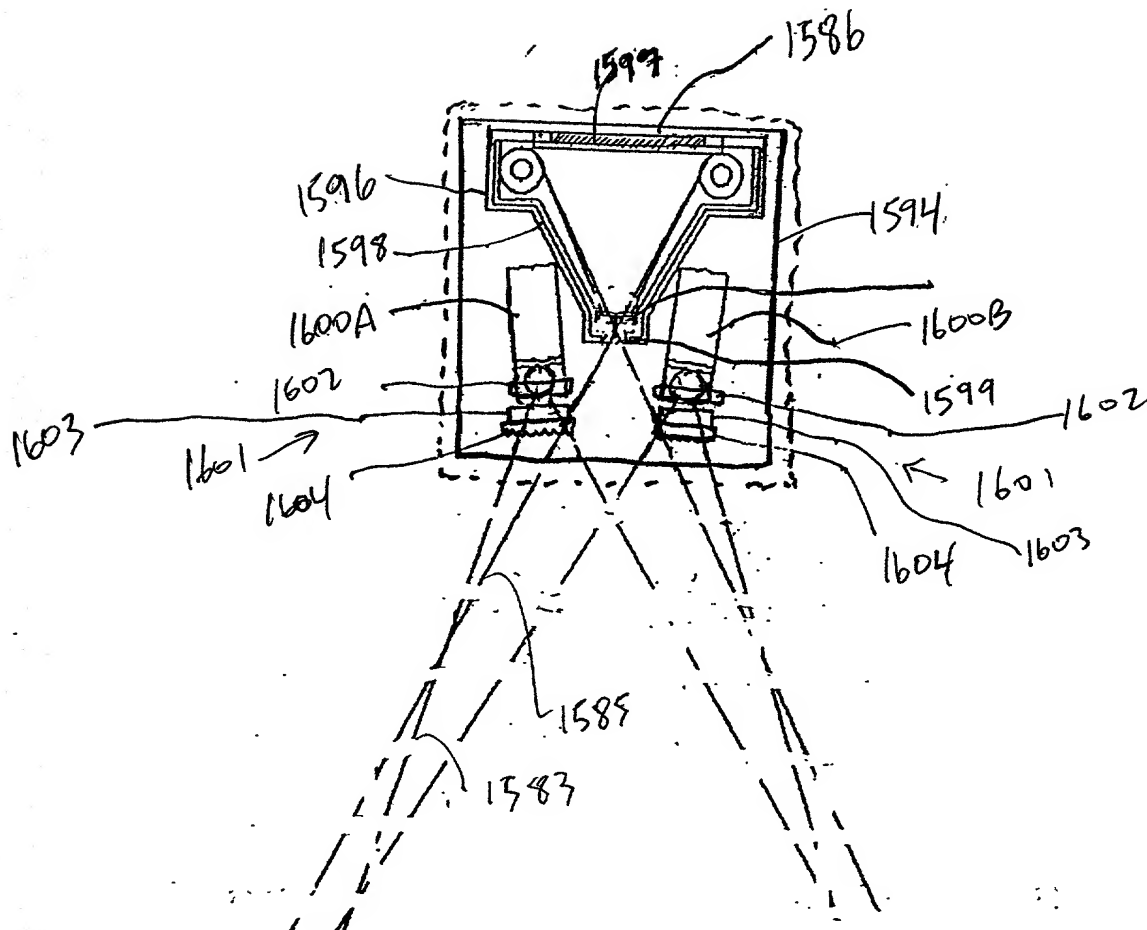


FIG. 43C

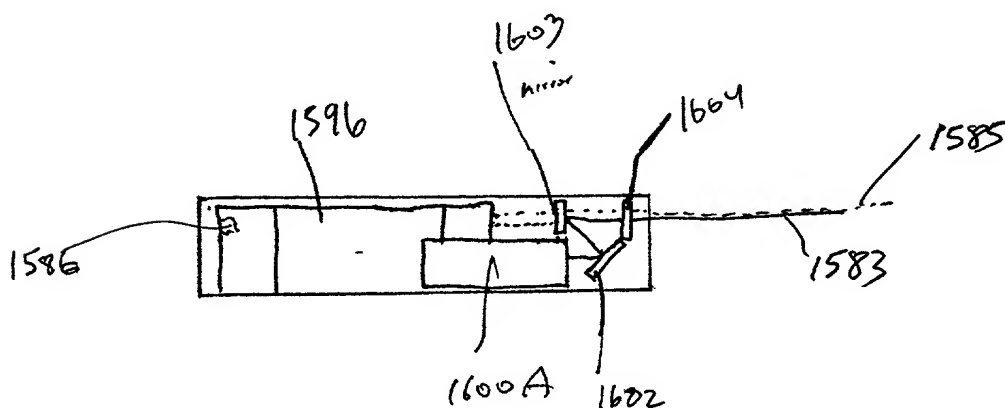


FIG. 43D

200603-020602

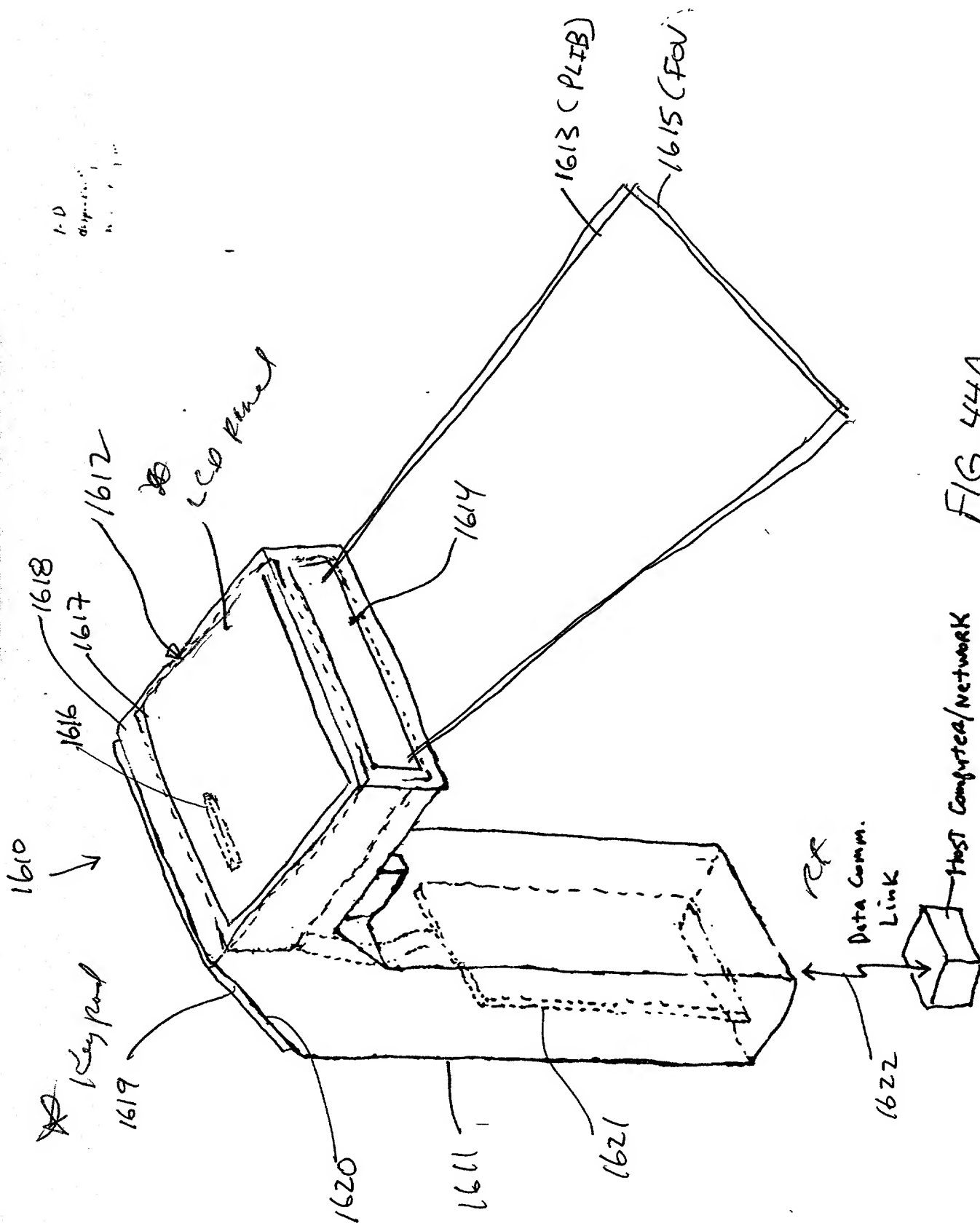
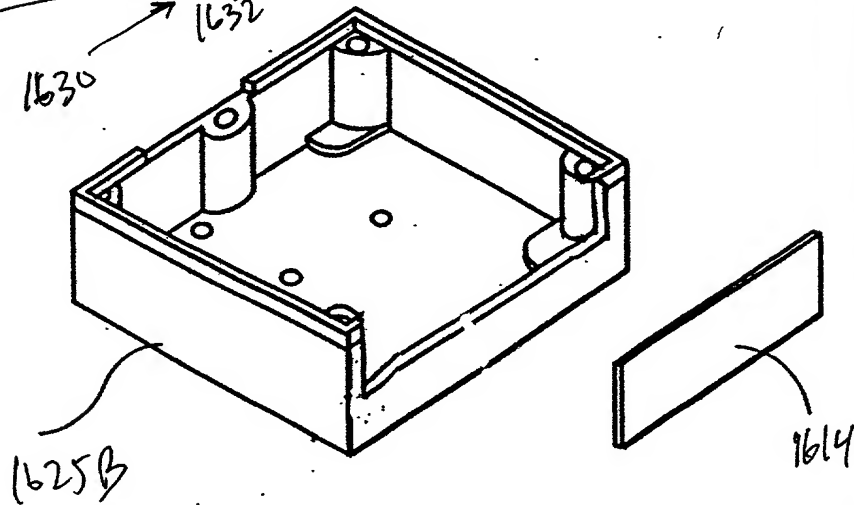
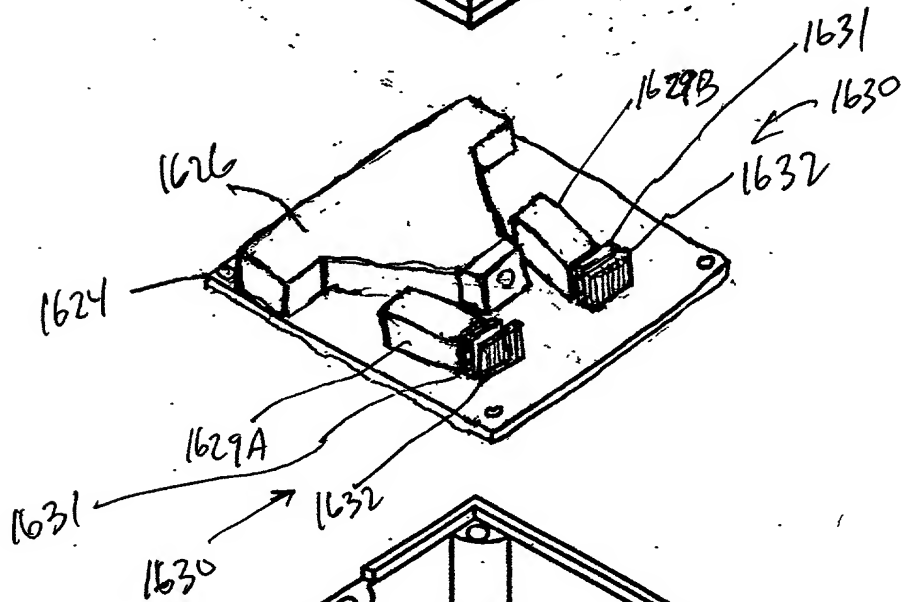
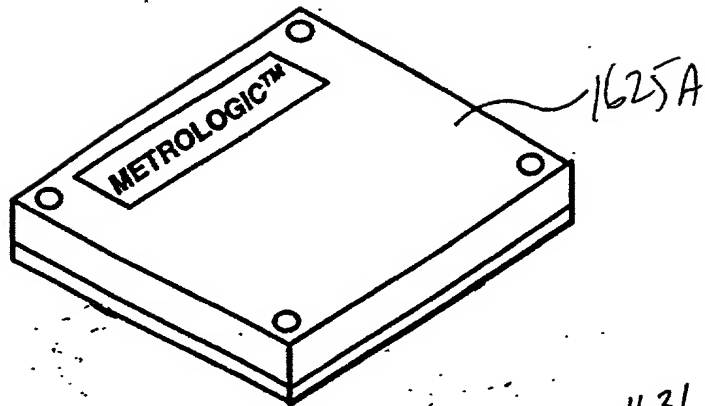


FIG. 44A

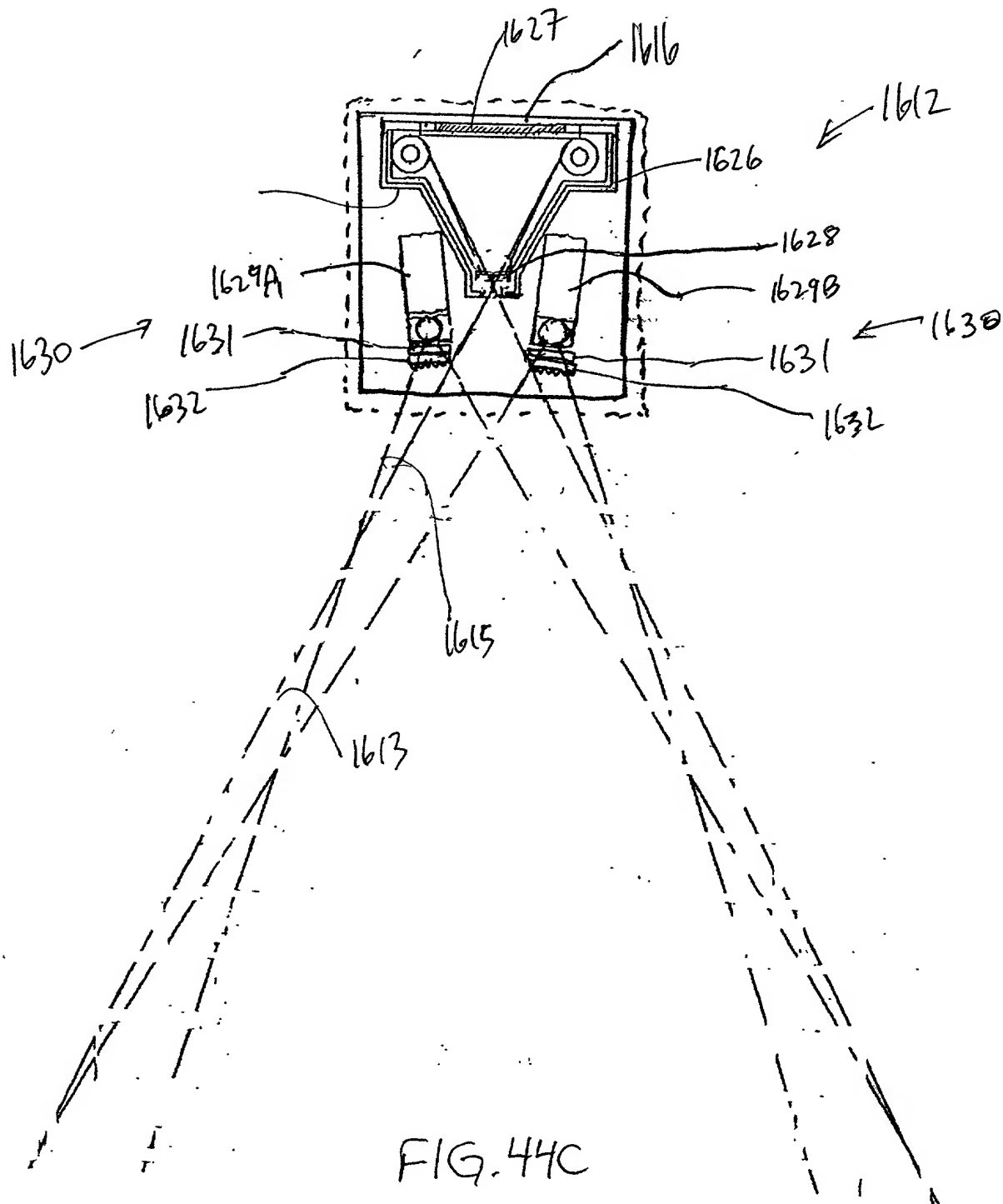
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FIG. 44B

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2099020-103299001

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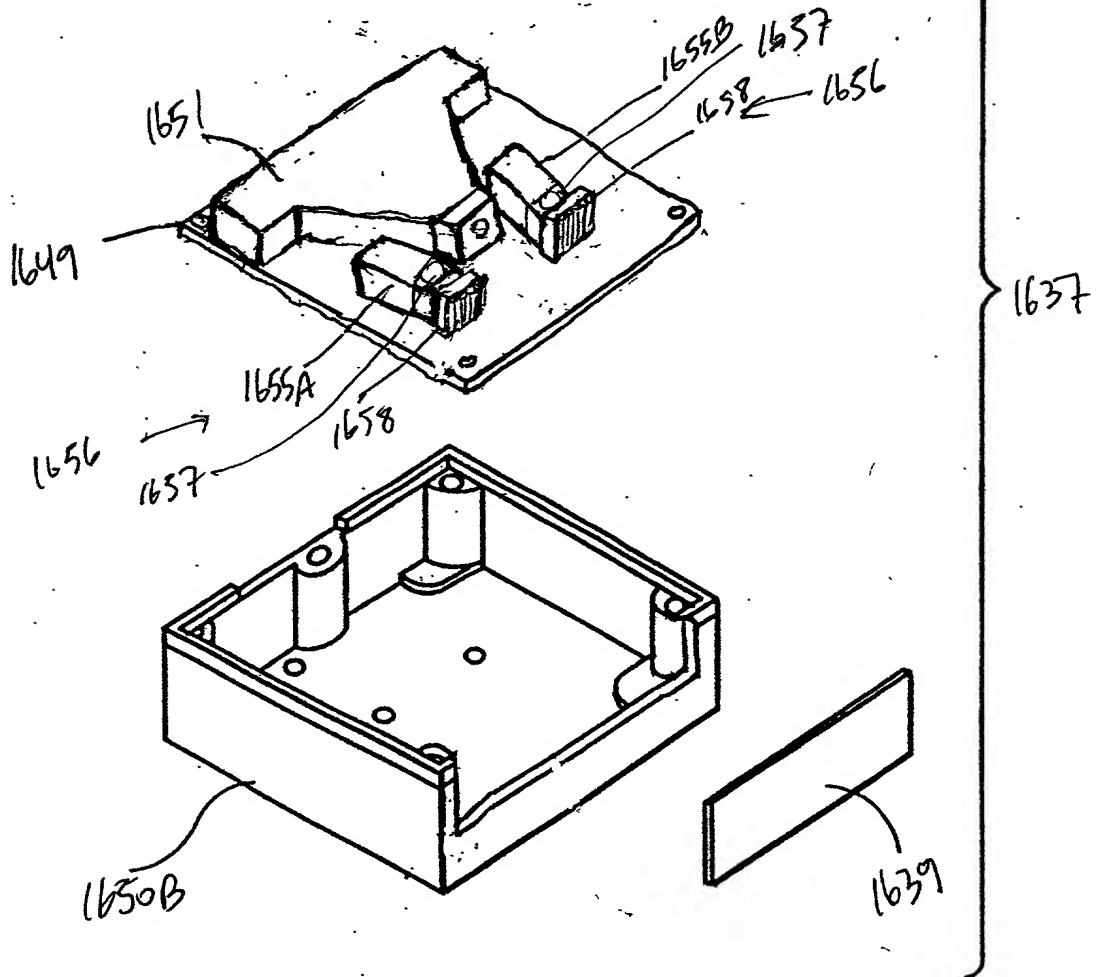
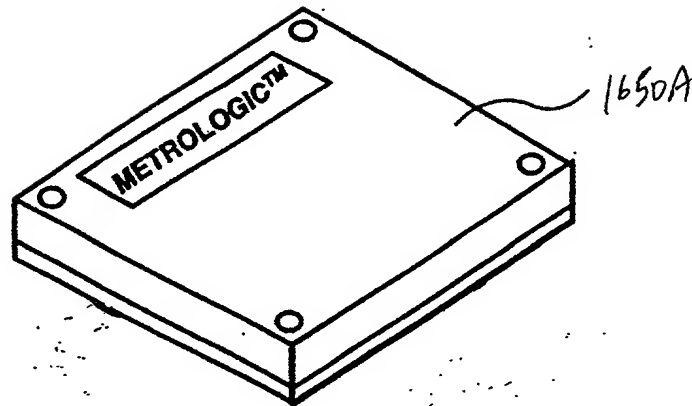


FIG. 45B

200603-020602

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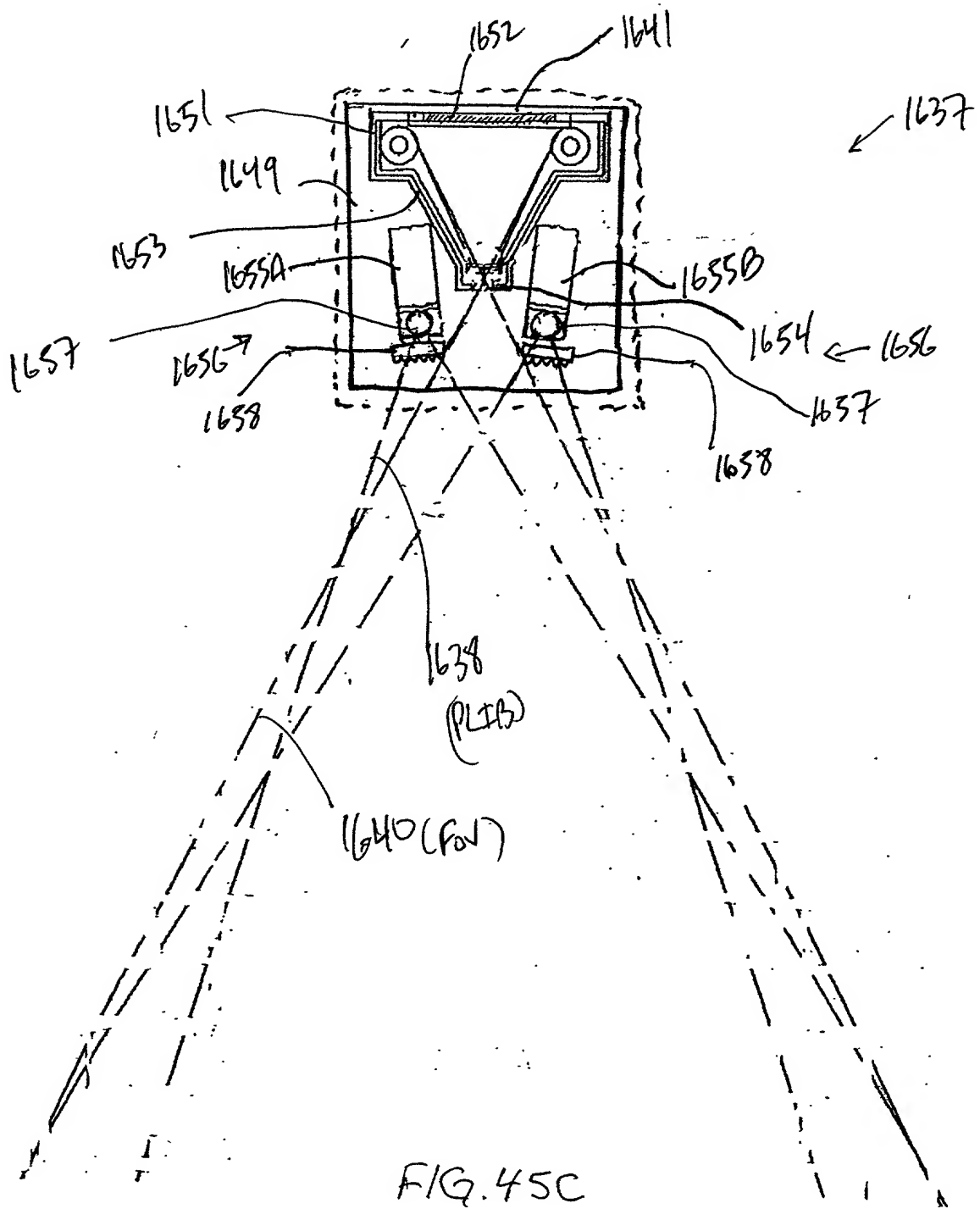
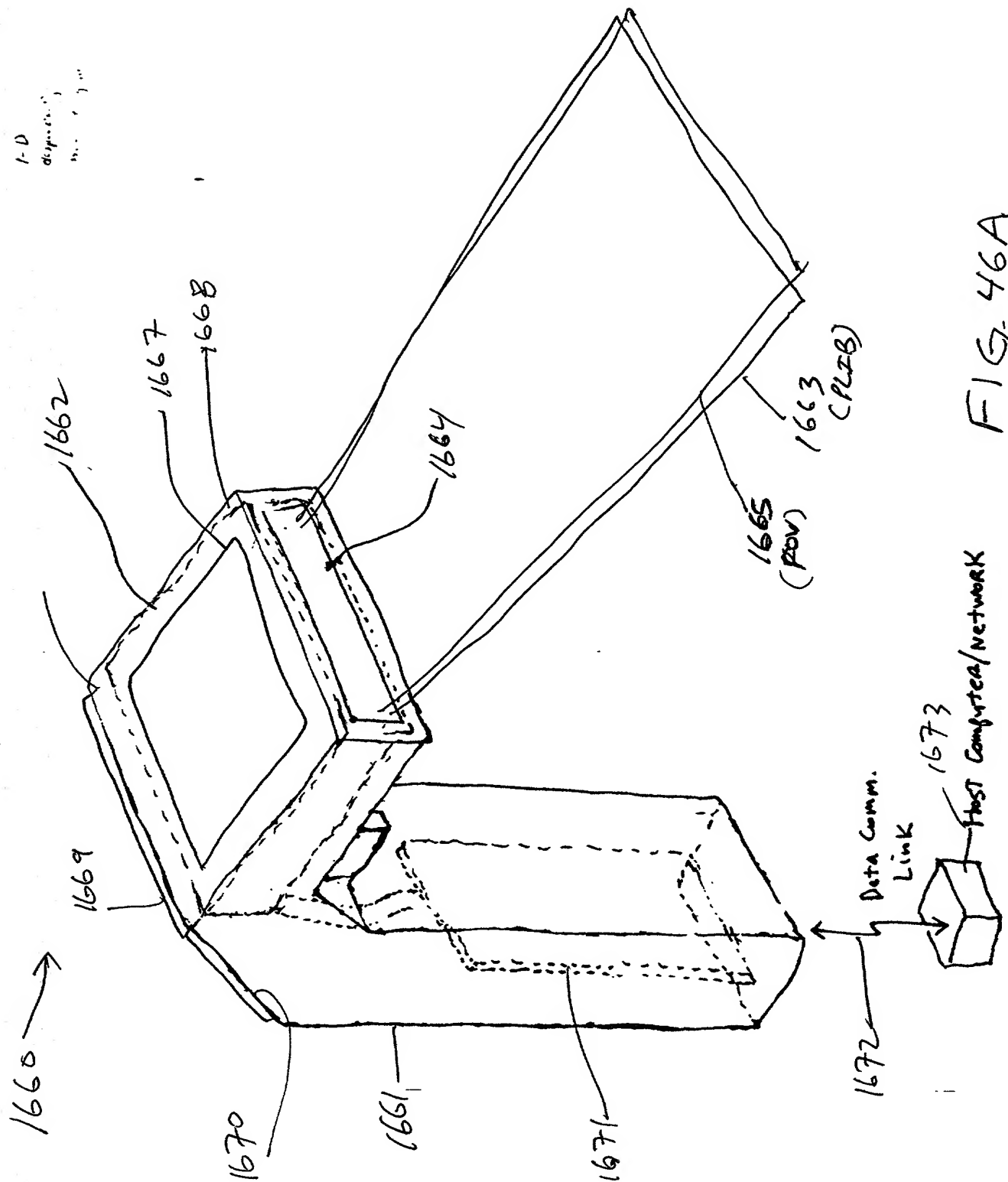


FIG. 45C

20060803-020602

211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185 1186 118

1-D



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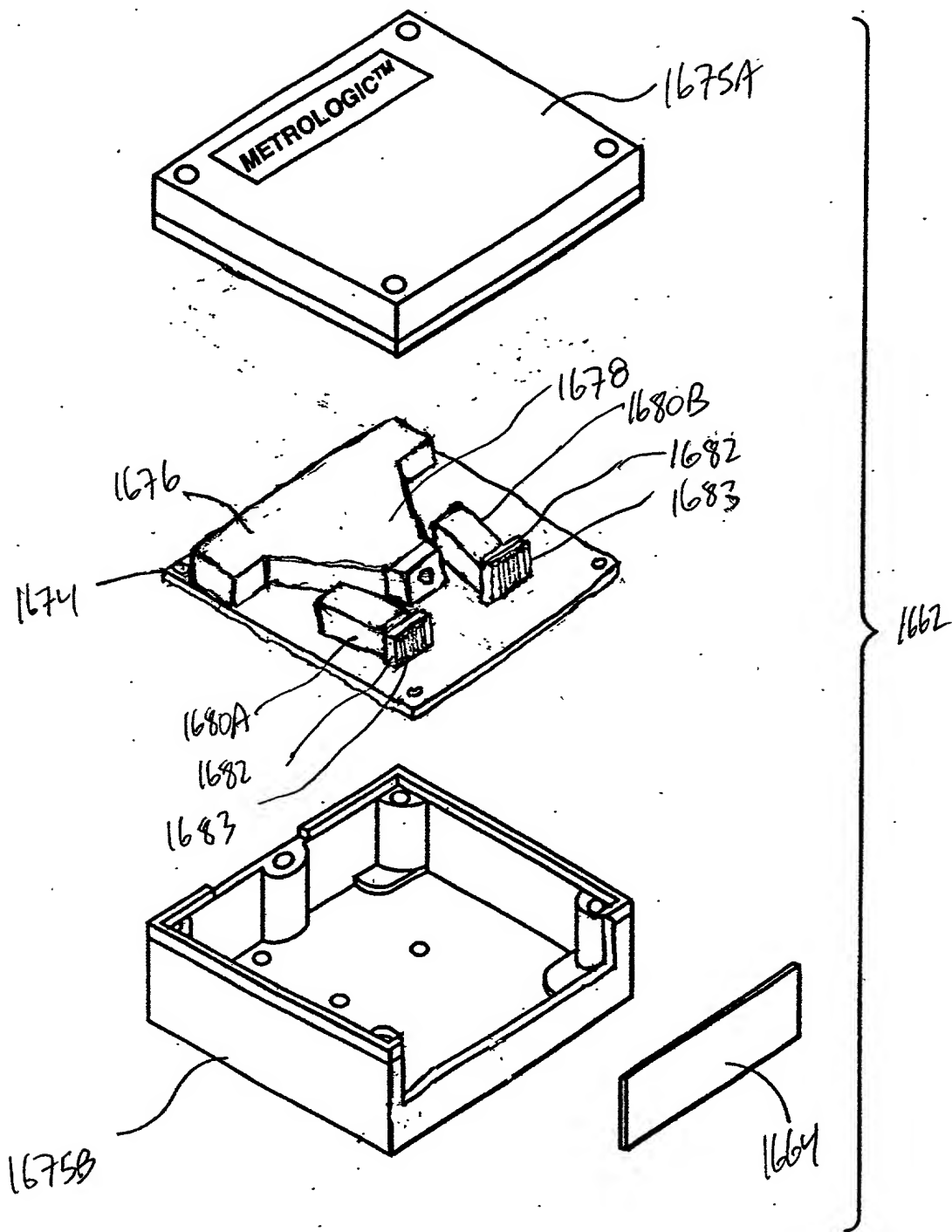
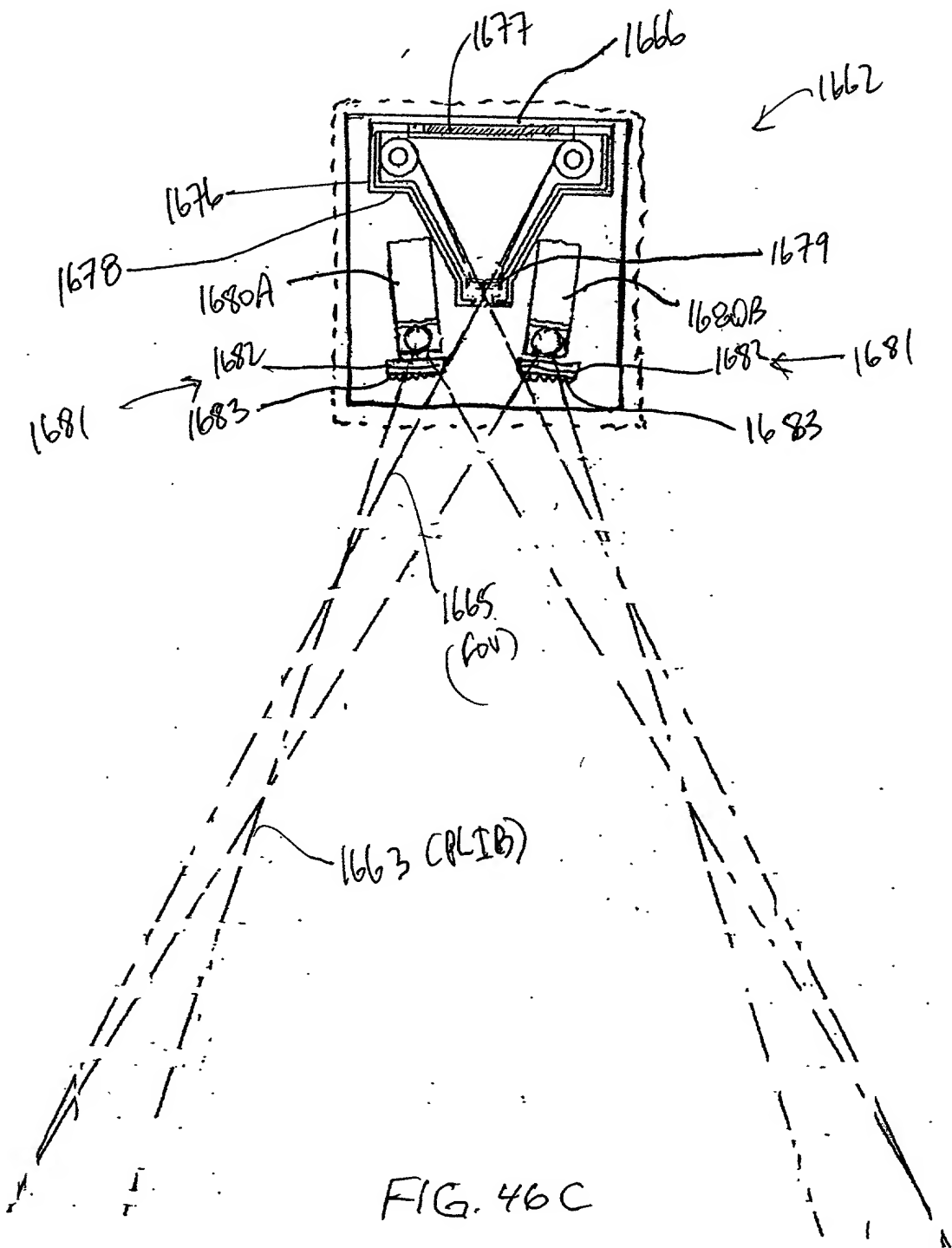


FIG. 46B

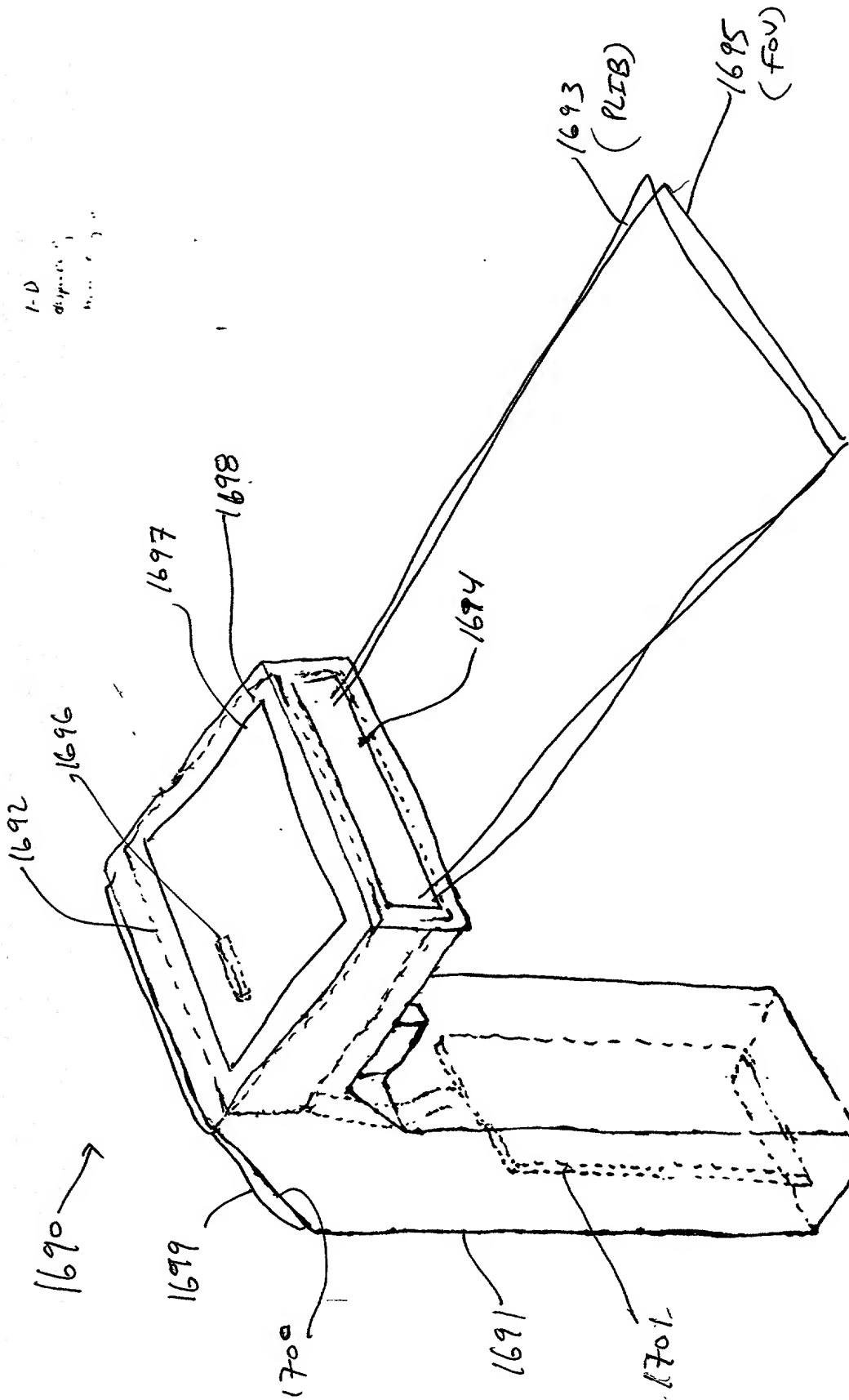
10068803-020602

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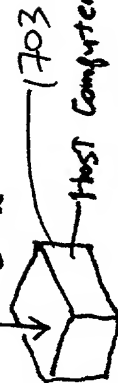


10068803-020502

1-D
display
unit



Data Comm.
Link



Host Computer/Network

FIG. 47A

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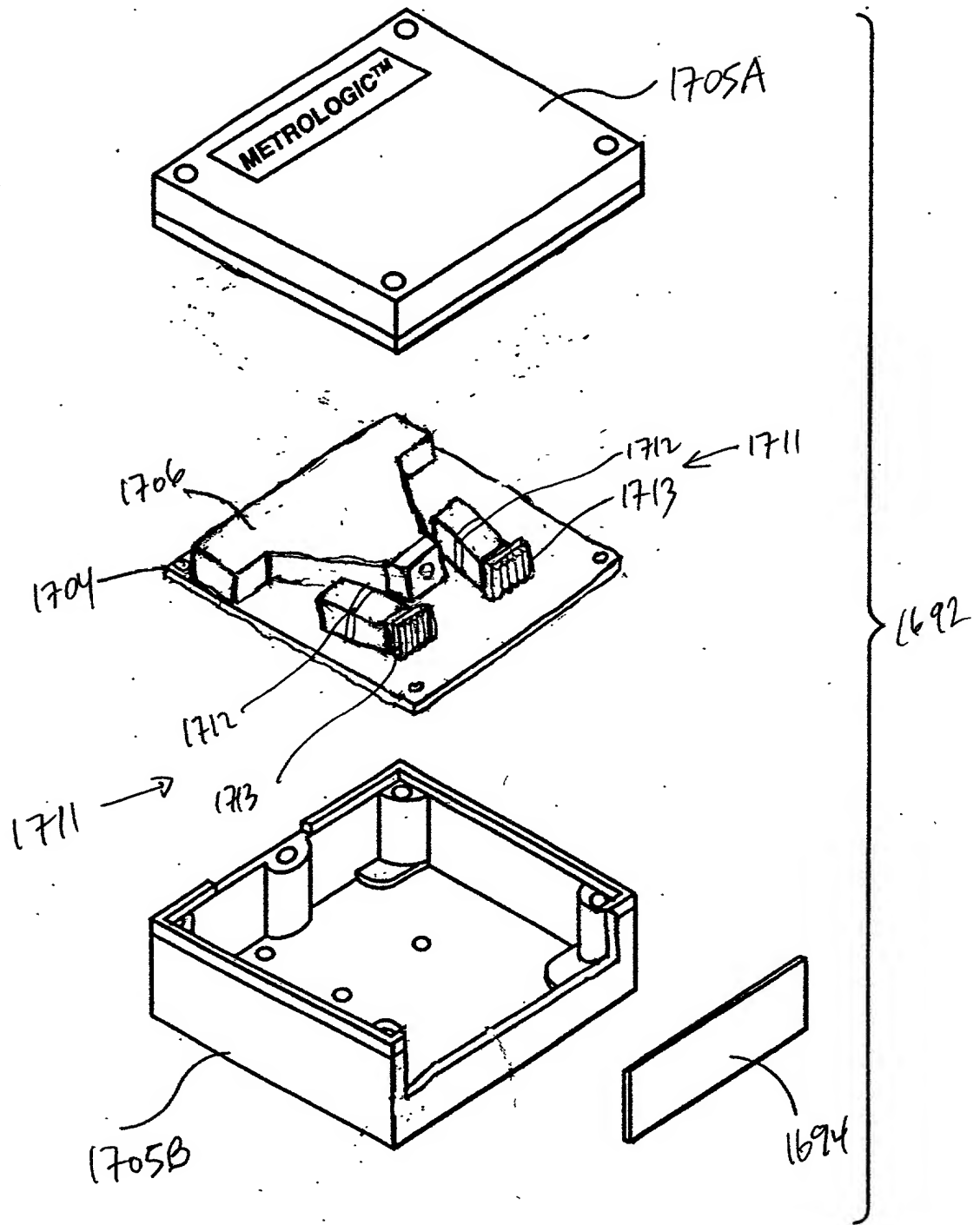


FIG. 47B

10066803-020602

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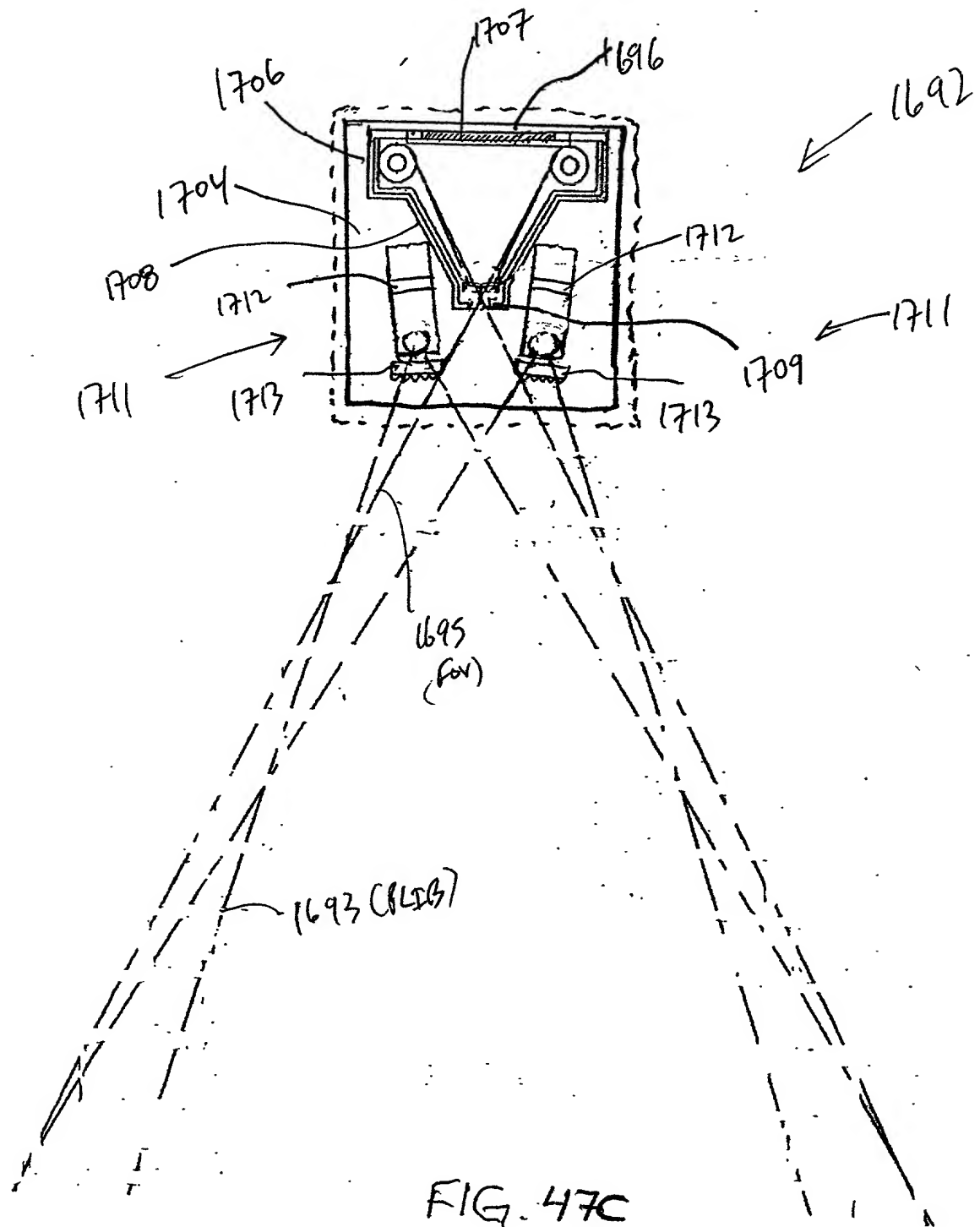


FIG. 47C

10068803-020602

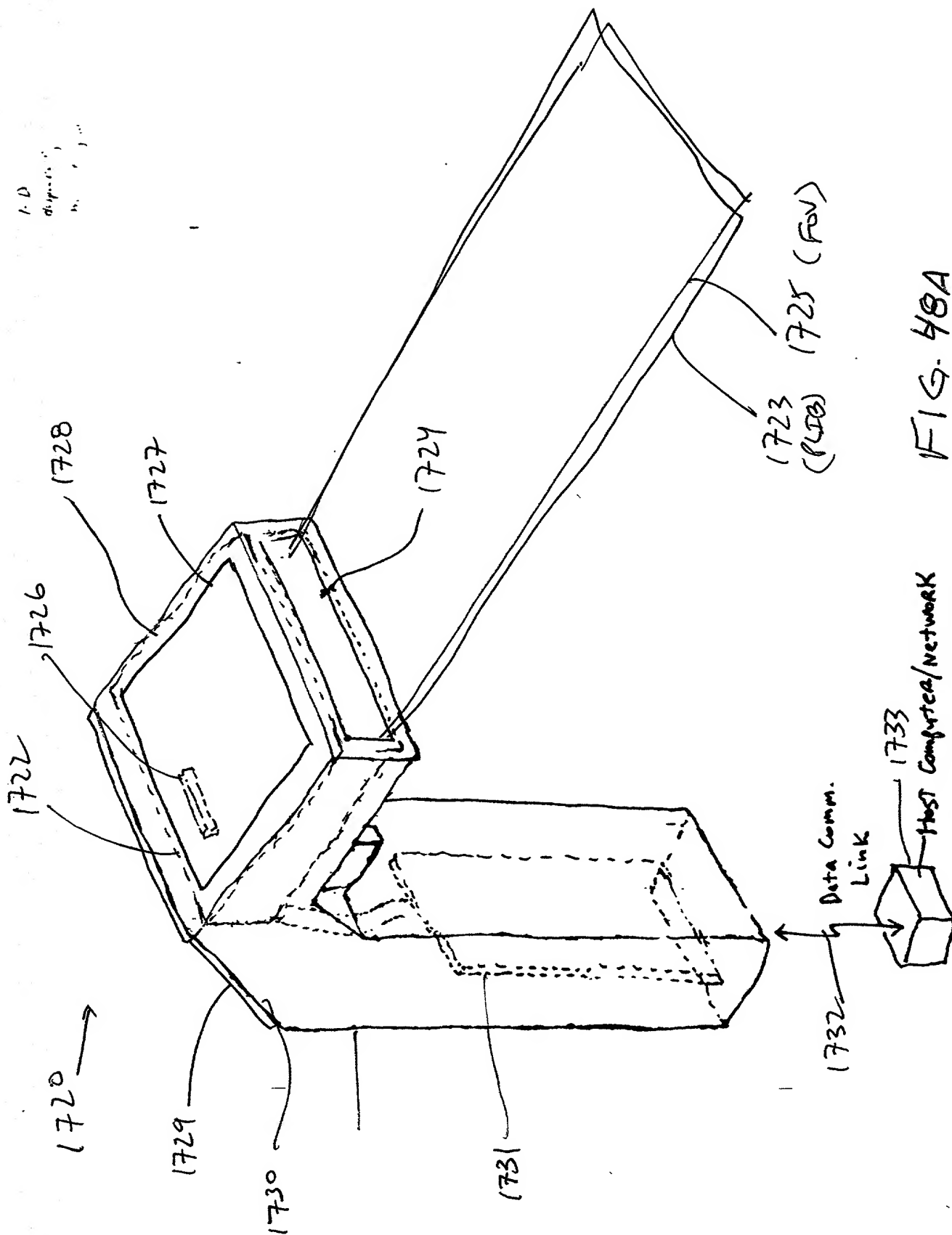


FIG. 48A

[Faint, illegible text from bleed-through]

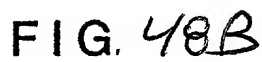


FIG. 48B

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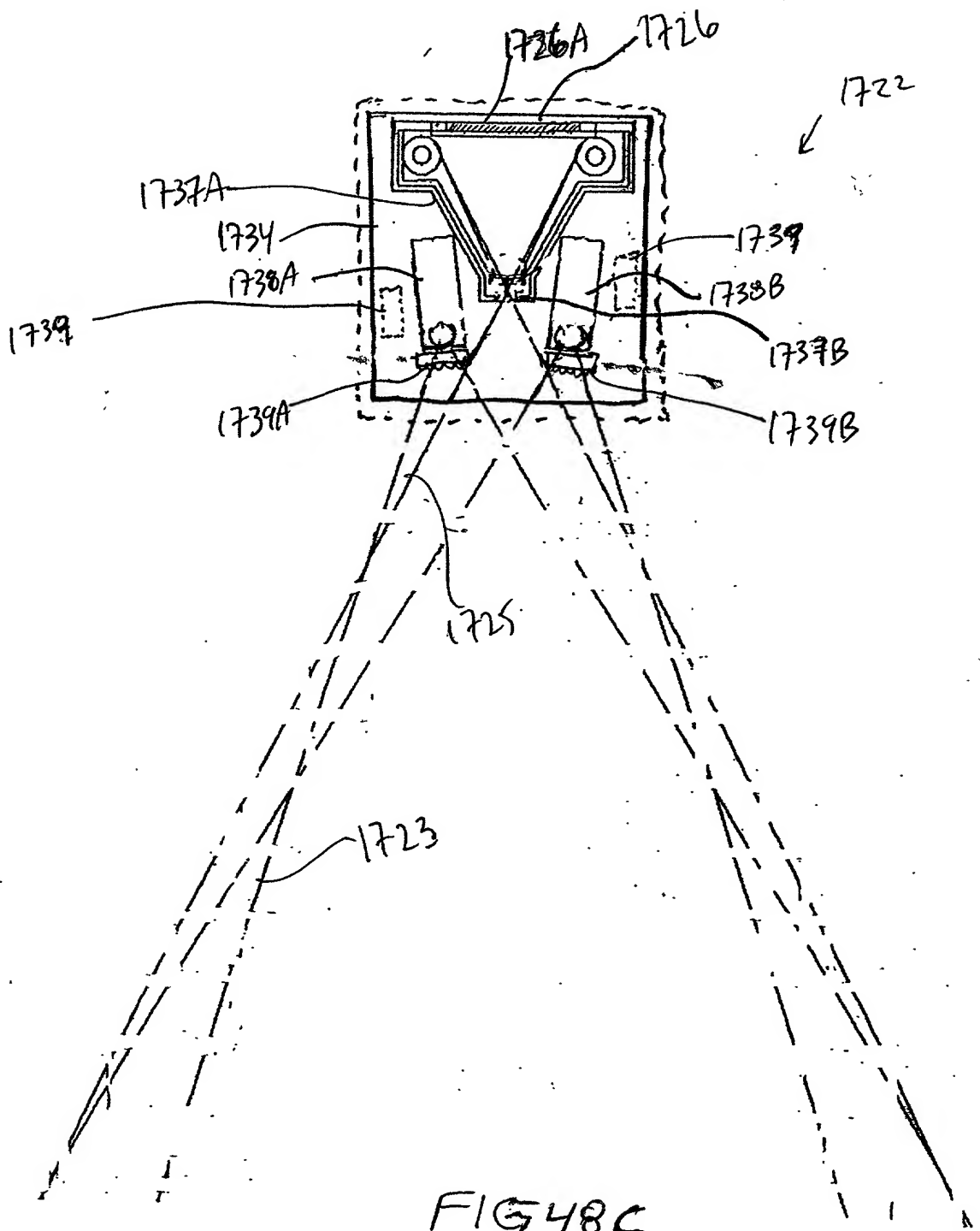


FIG. 48C

100608003.0206002

2009020-020000T

1-D
display
...

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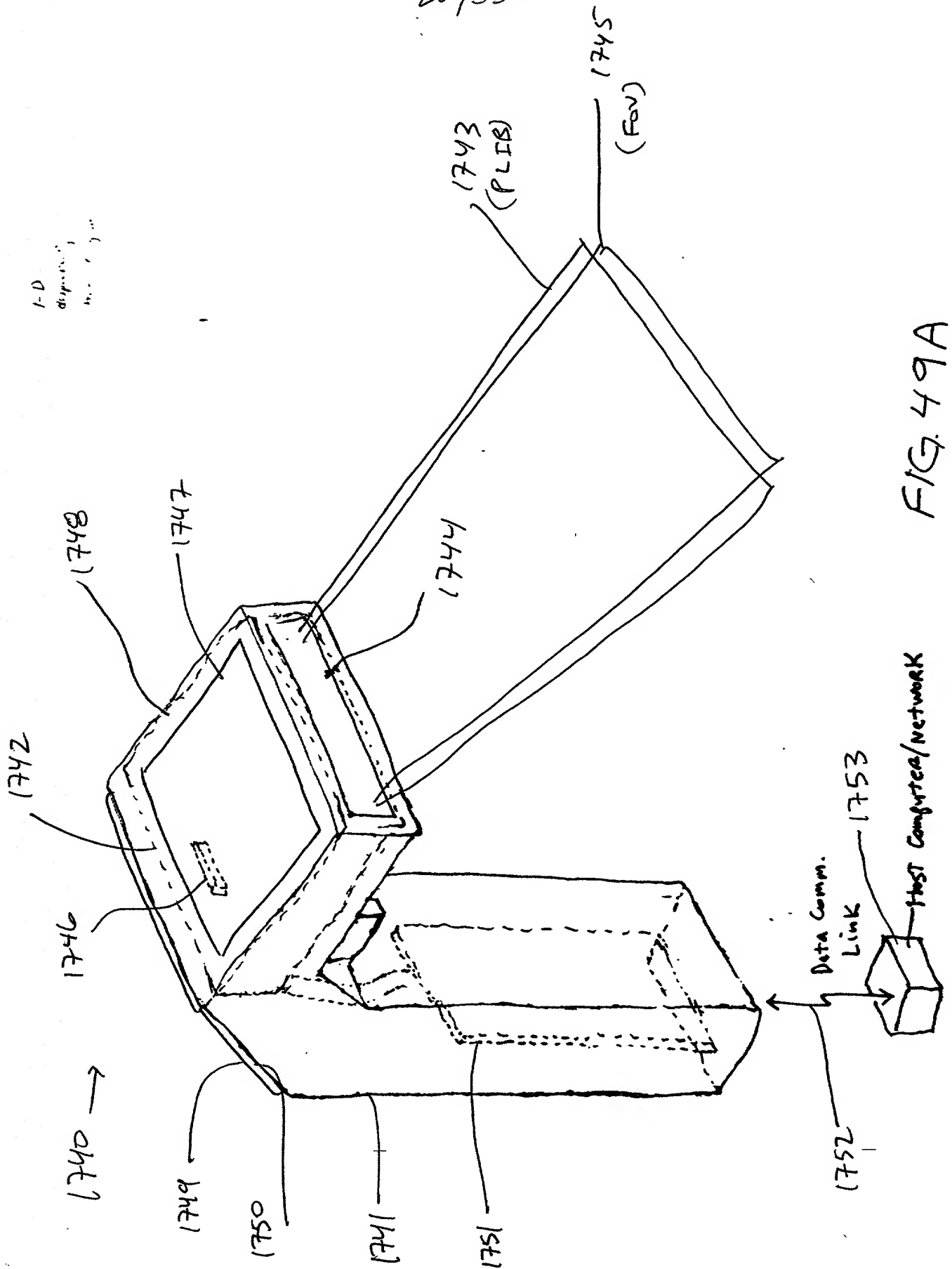


FIG. 49A

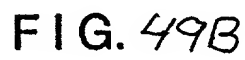


FIG. 49B

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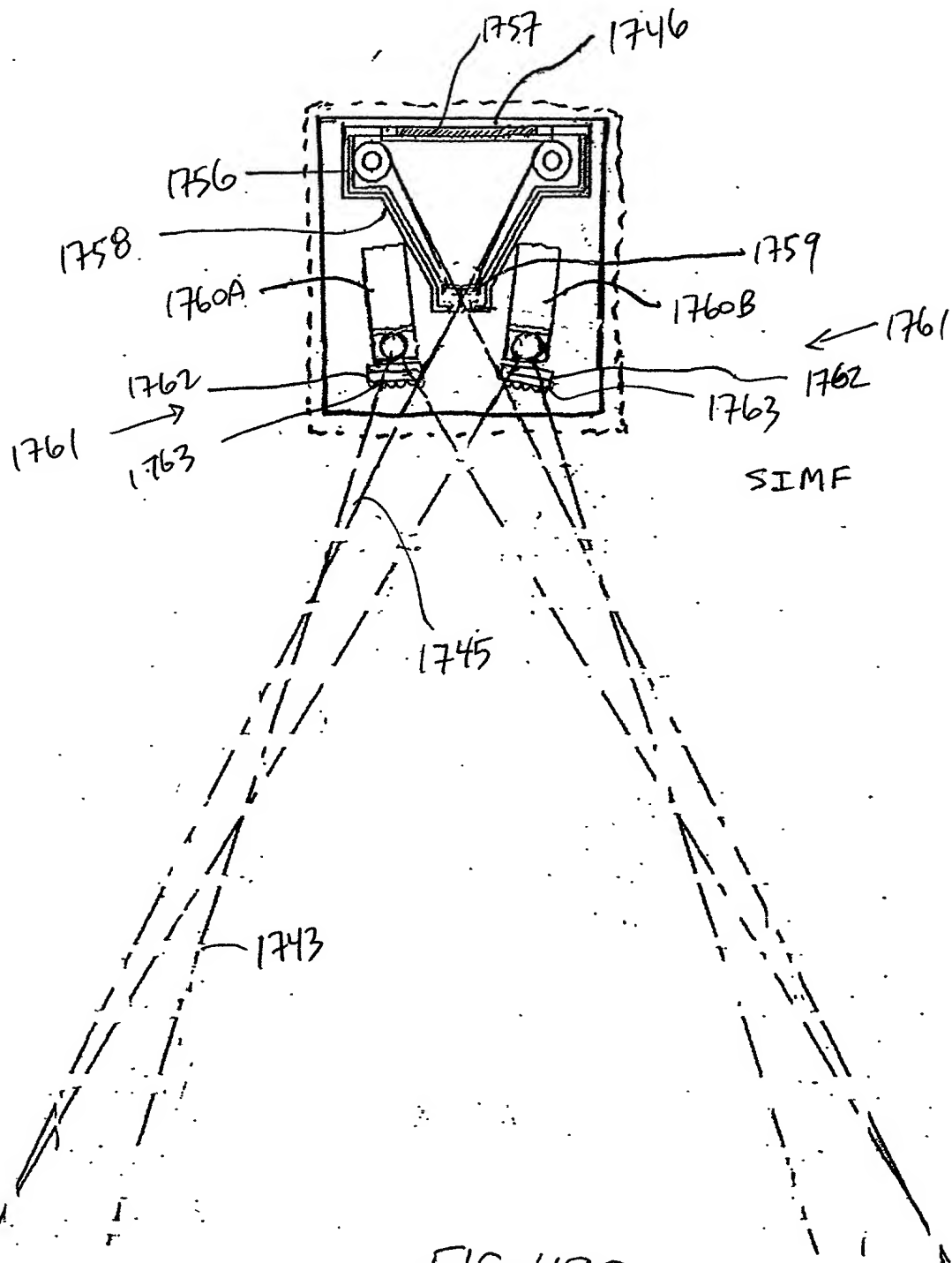
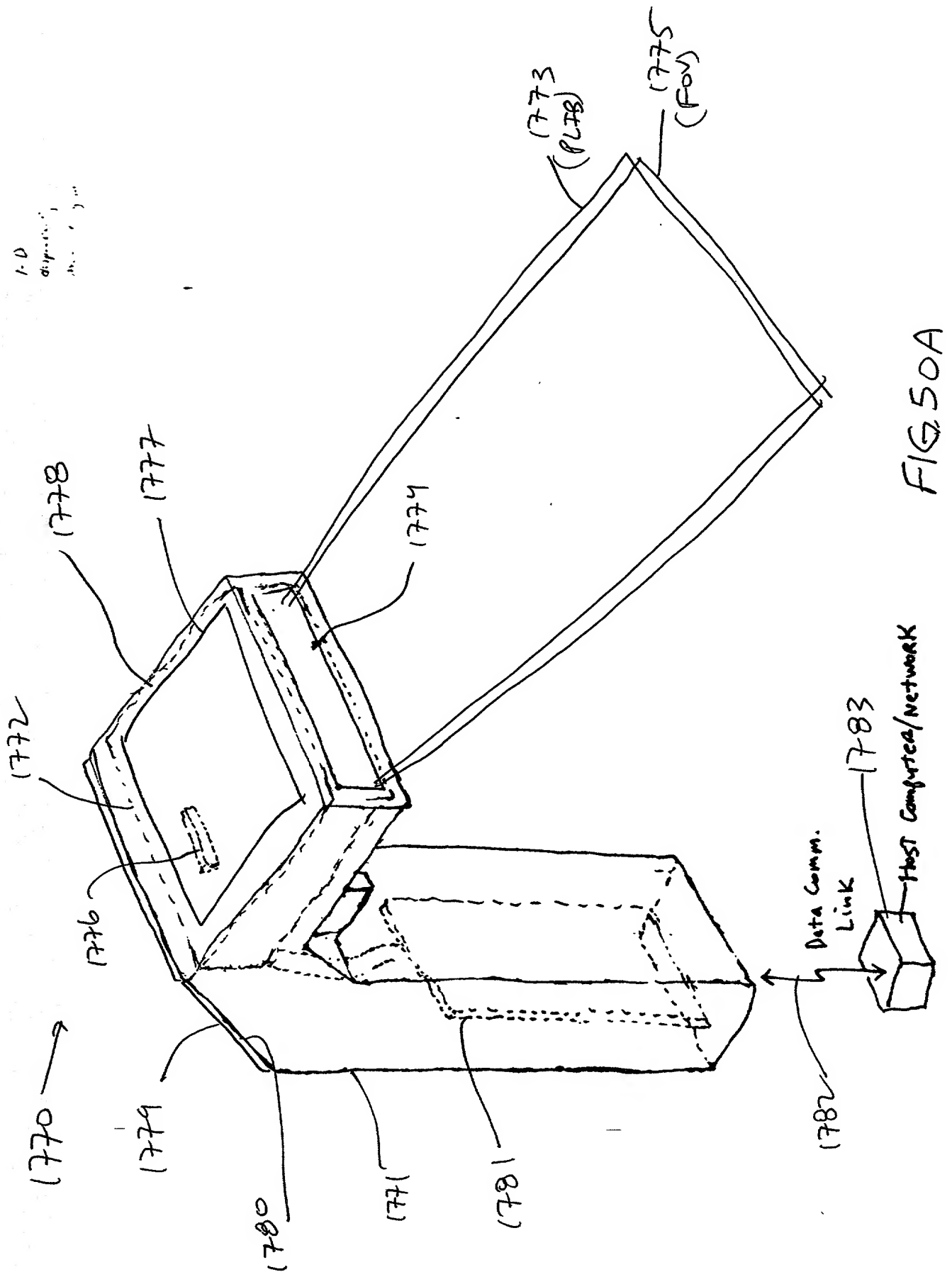


FIG. 49C

10068803.020602



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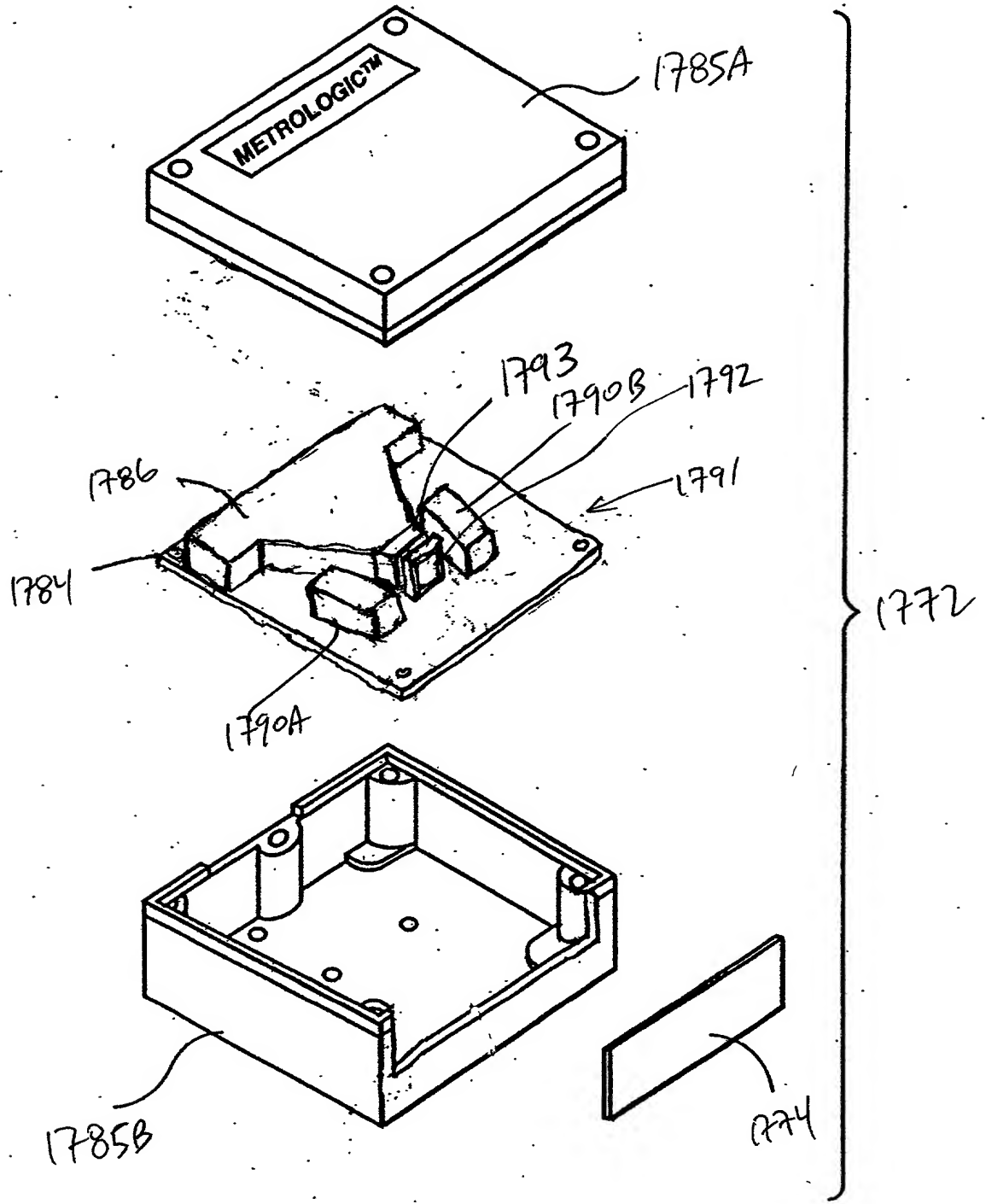
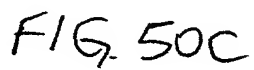


FIG. 50B

[Faint bleed-through from reverse side]



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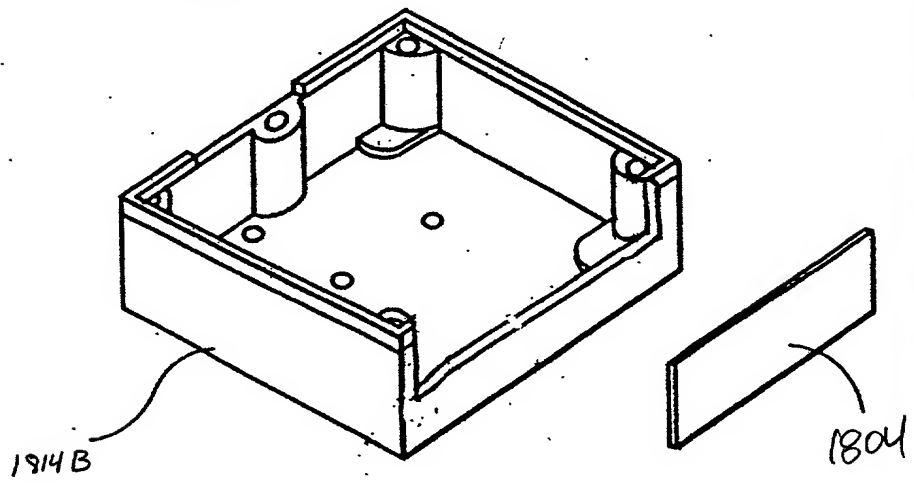
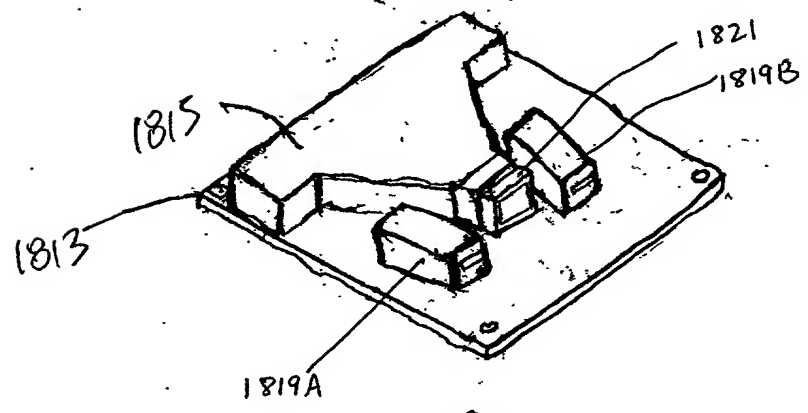
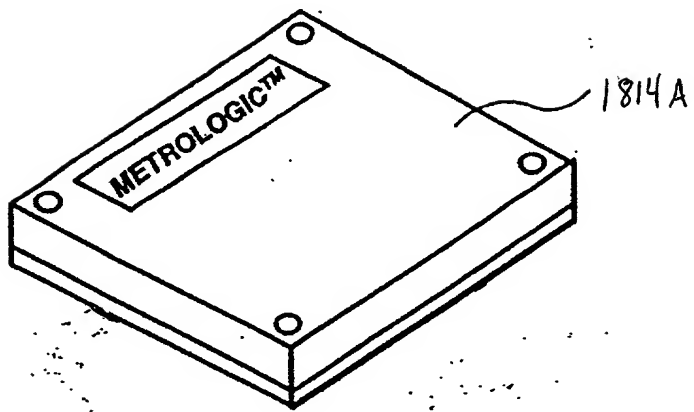
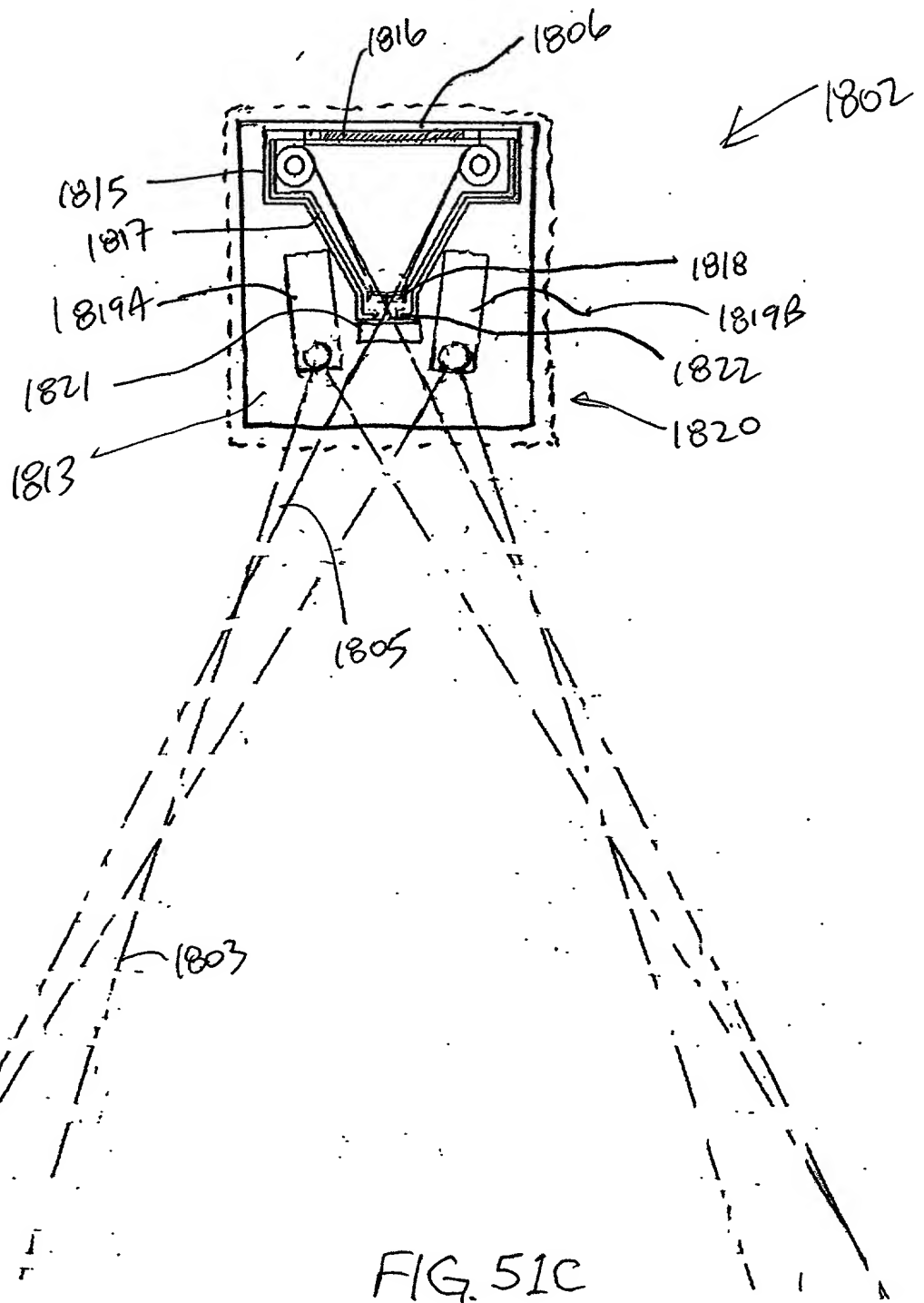


FIG. 51B

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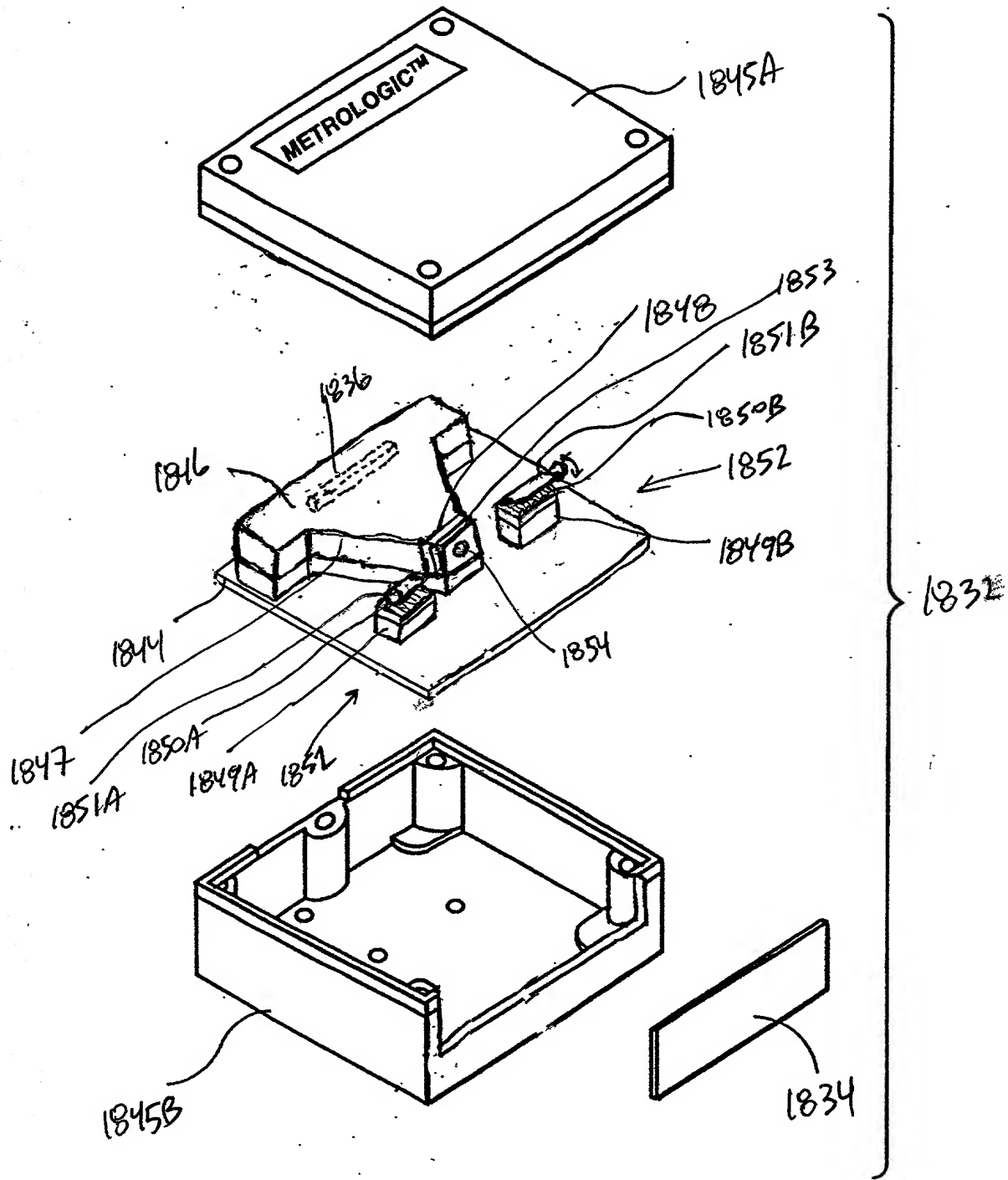
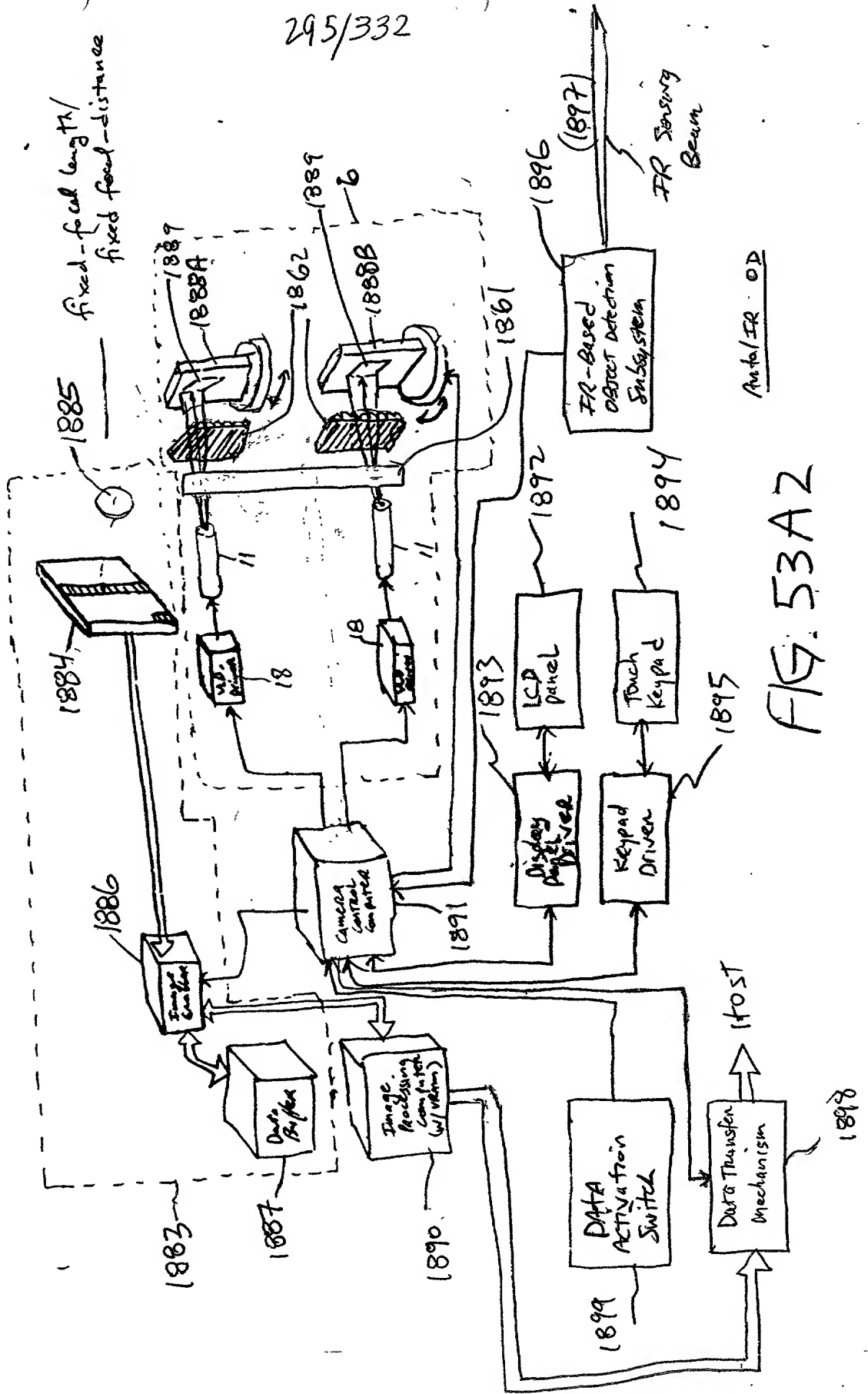


FIG. 52B

Fig. 1I3A-3B

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1880



fixed-focal length/
fixed focal-distance

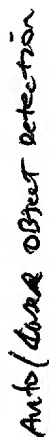
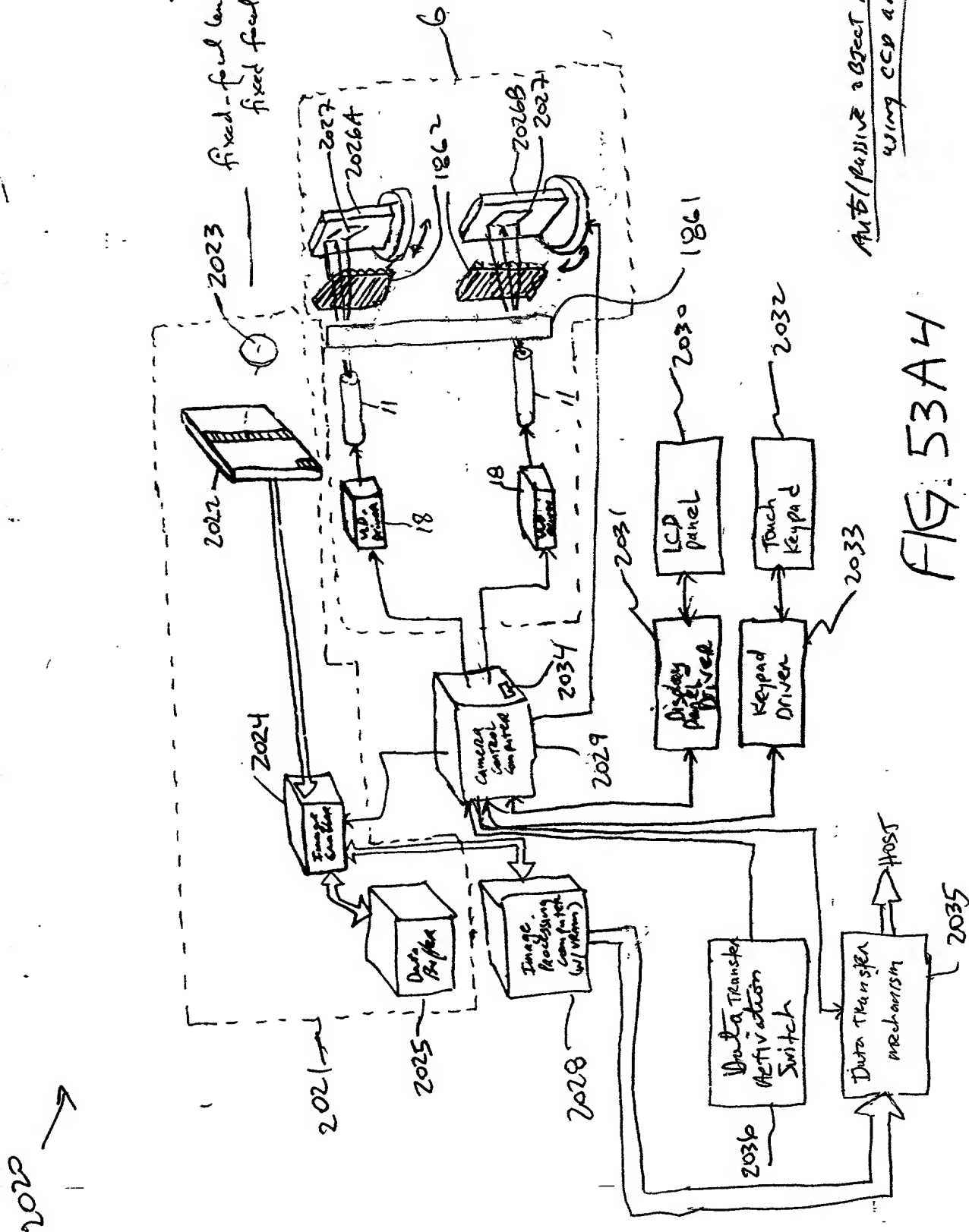


FIG. 53A3

[illegible]

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Auto/Passive Object Detection using CCP array




2040 ↗

fixed-focal length/
fixed focal-distance

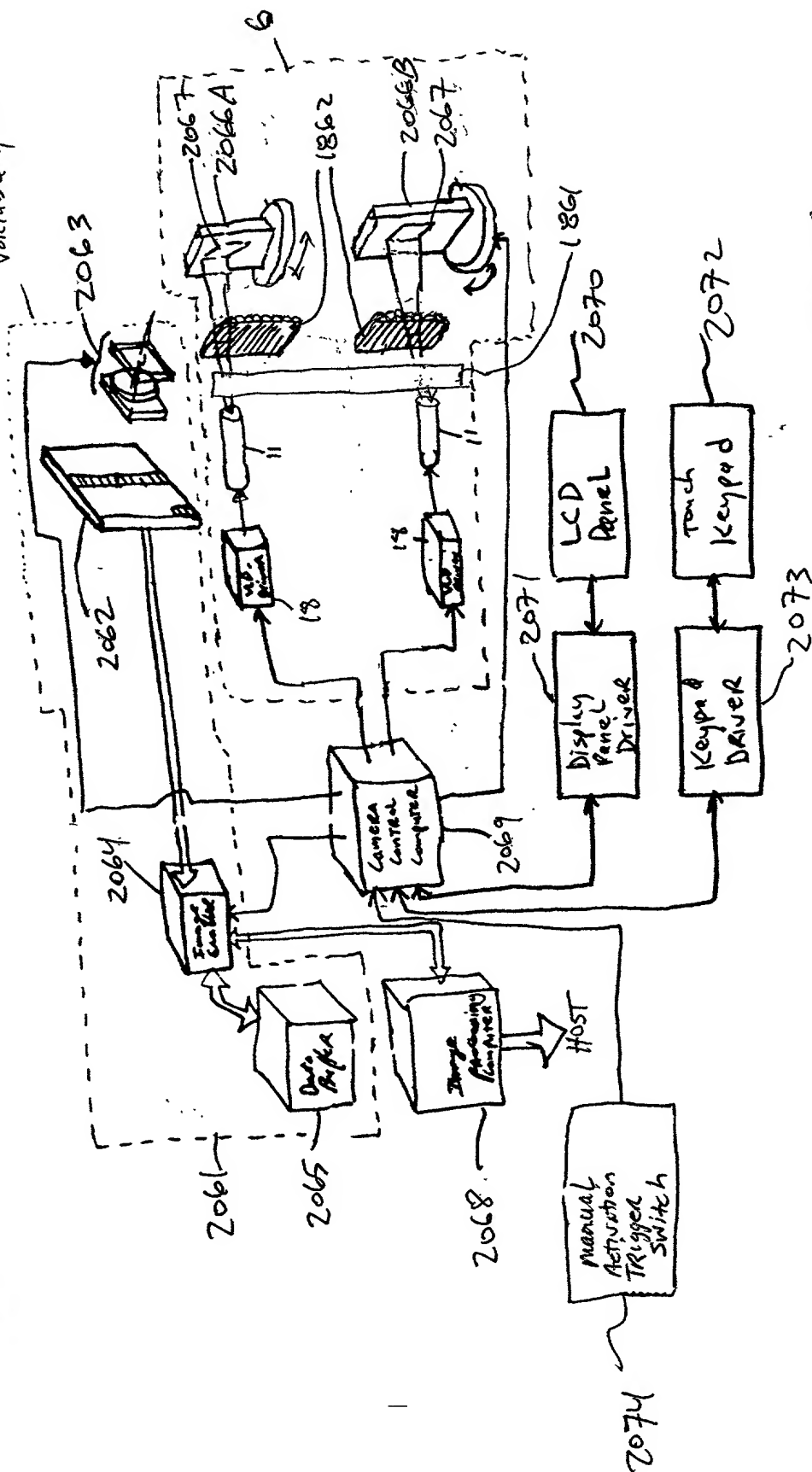


FIG. 53A5

2060 

fixed focal length /
variable focal distance

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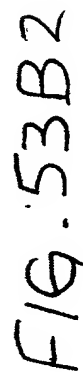


Manual

FIG. 53B1

2080

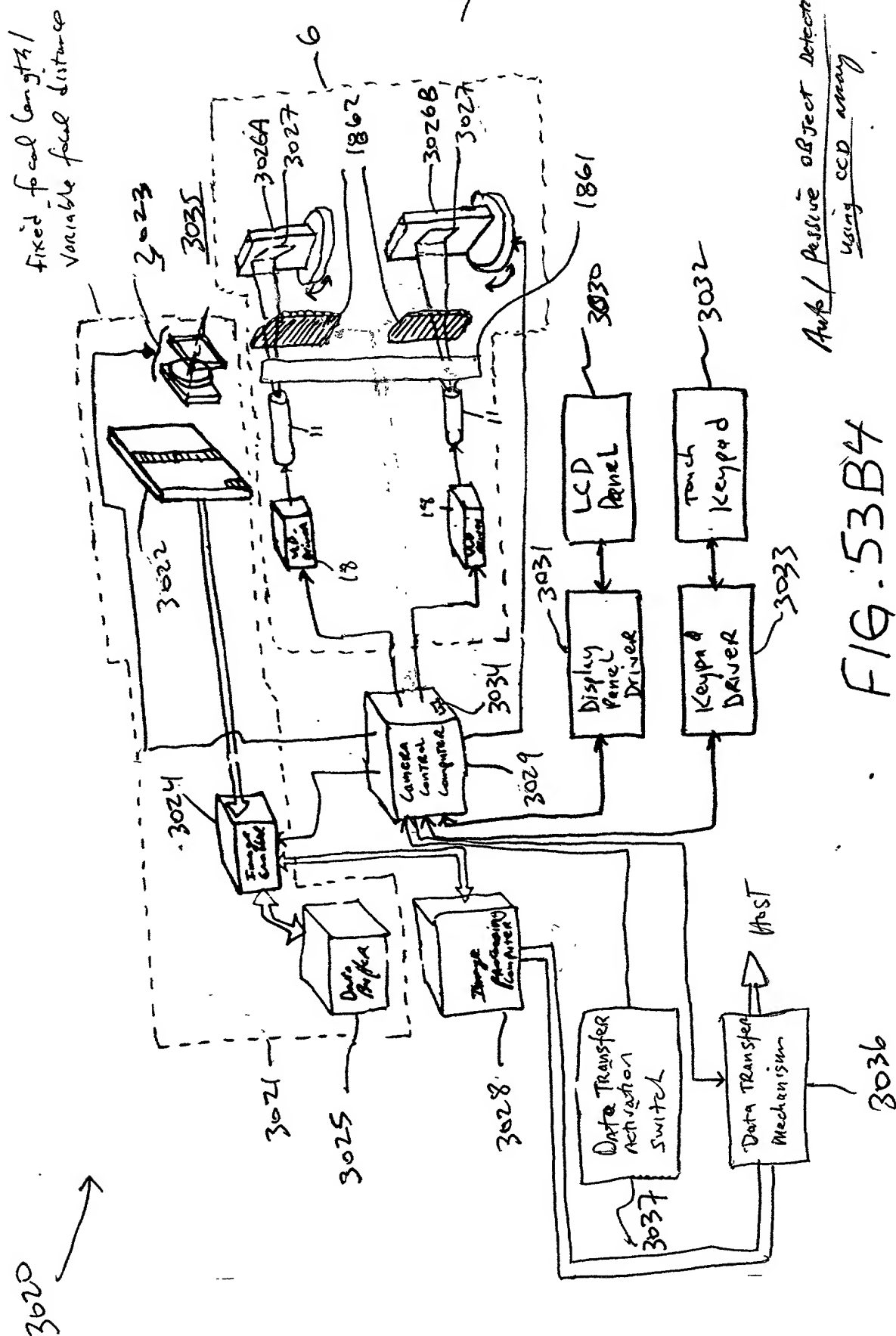
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3040 →

fixed focal length/
variable focal distance

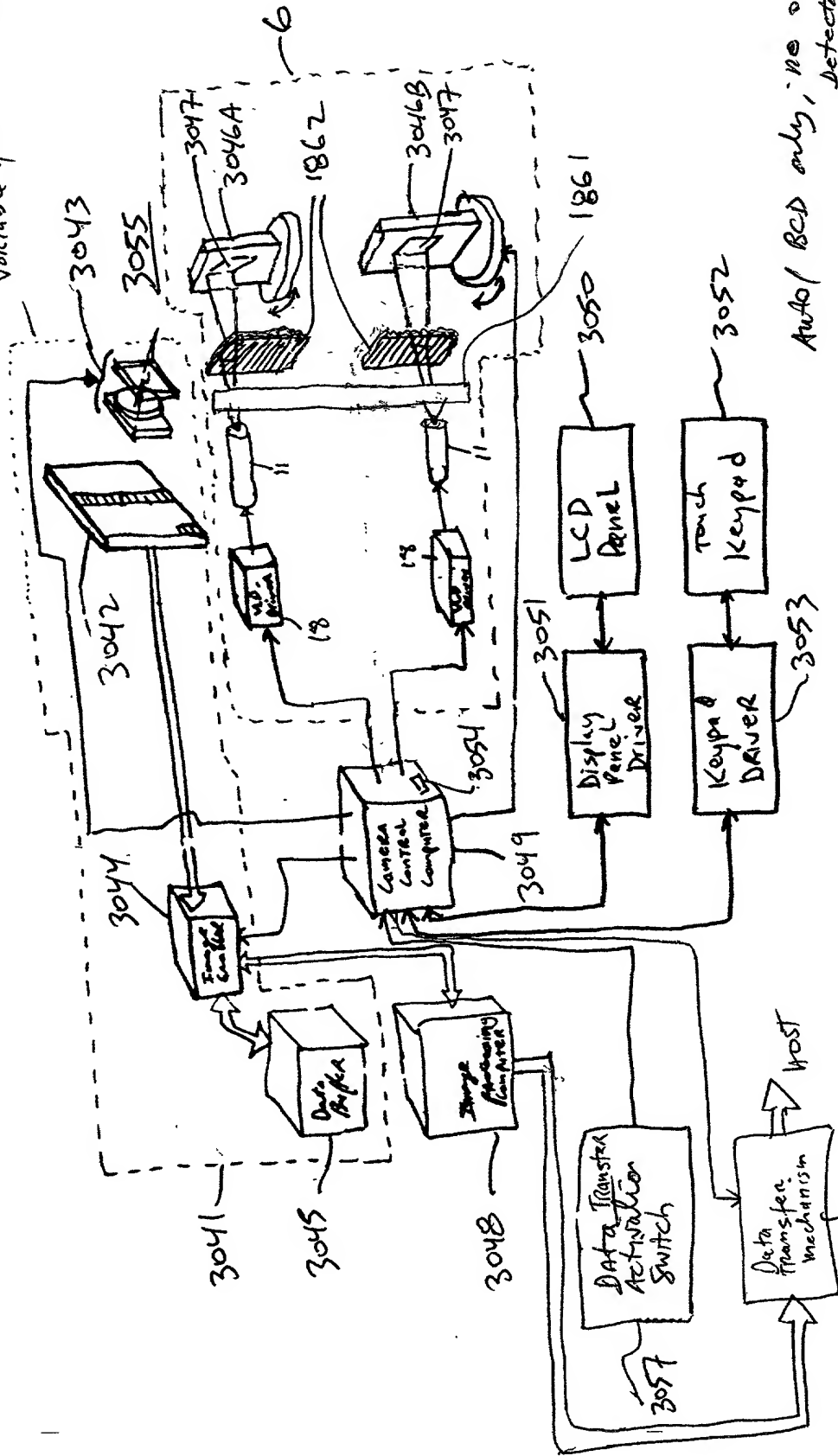
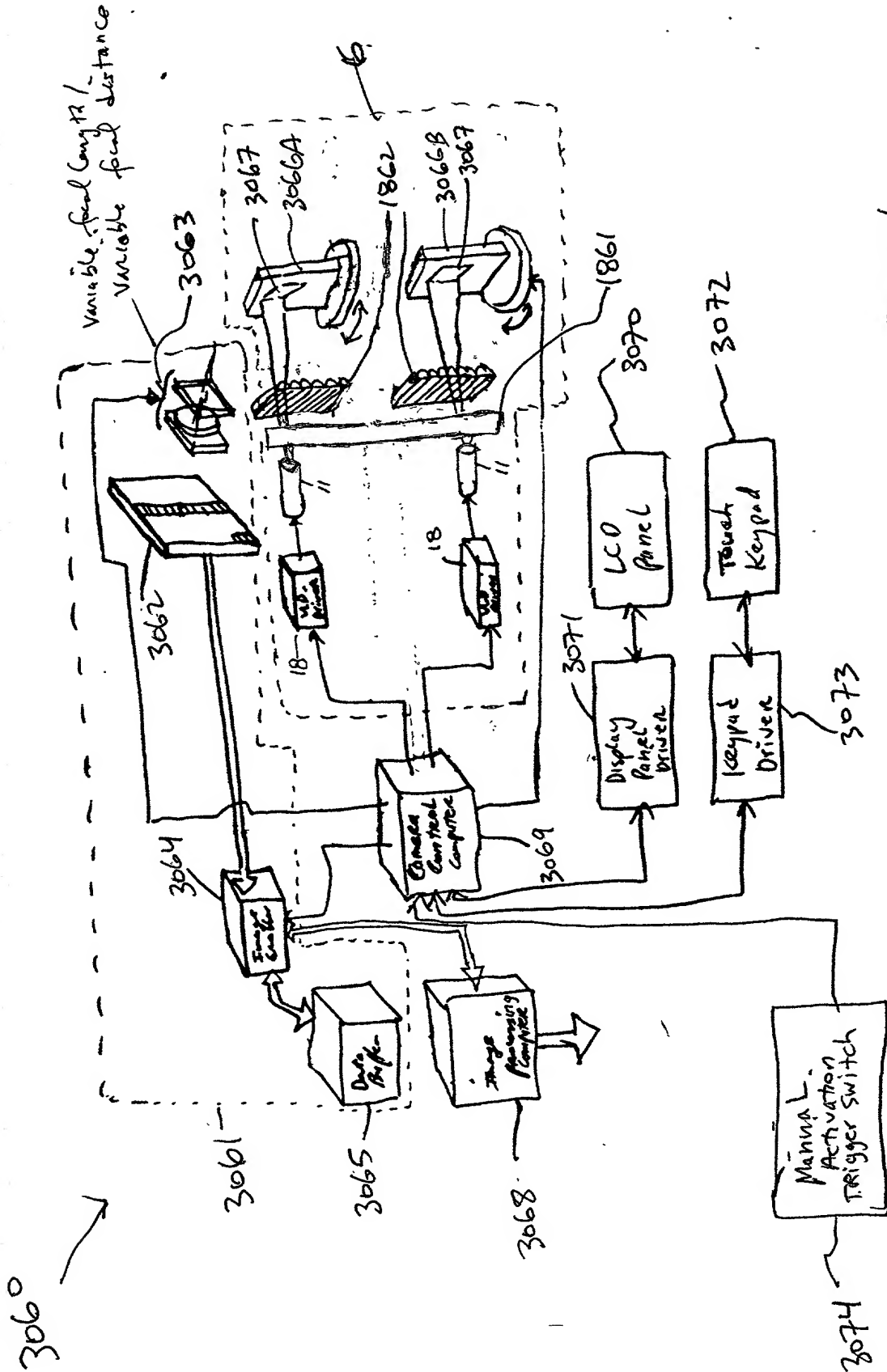
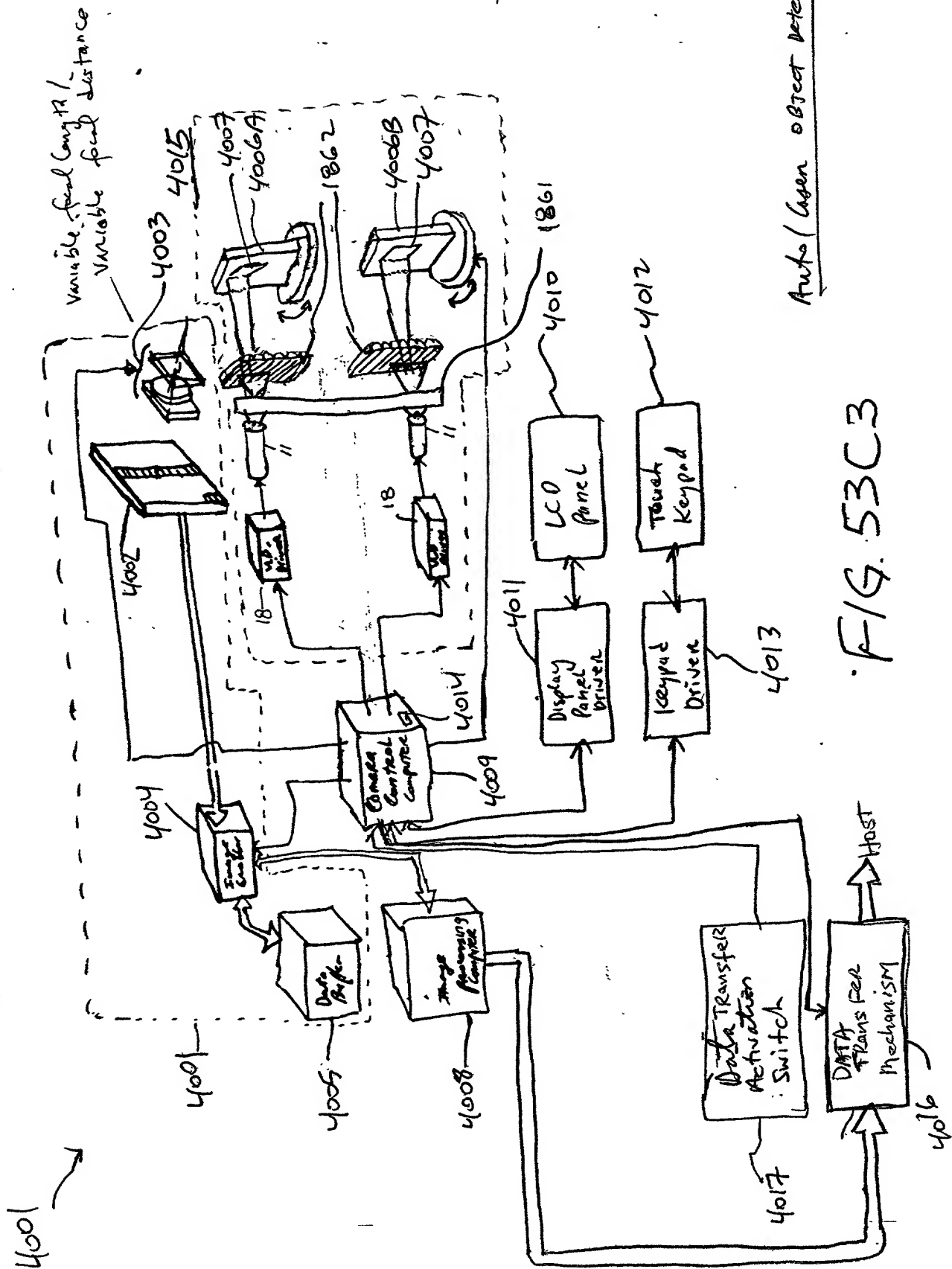


FIG. 53B5



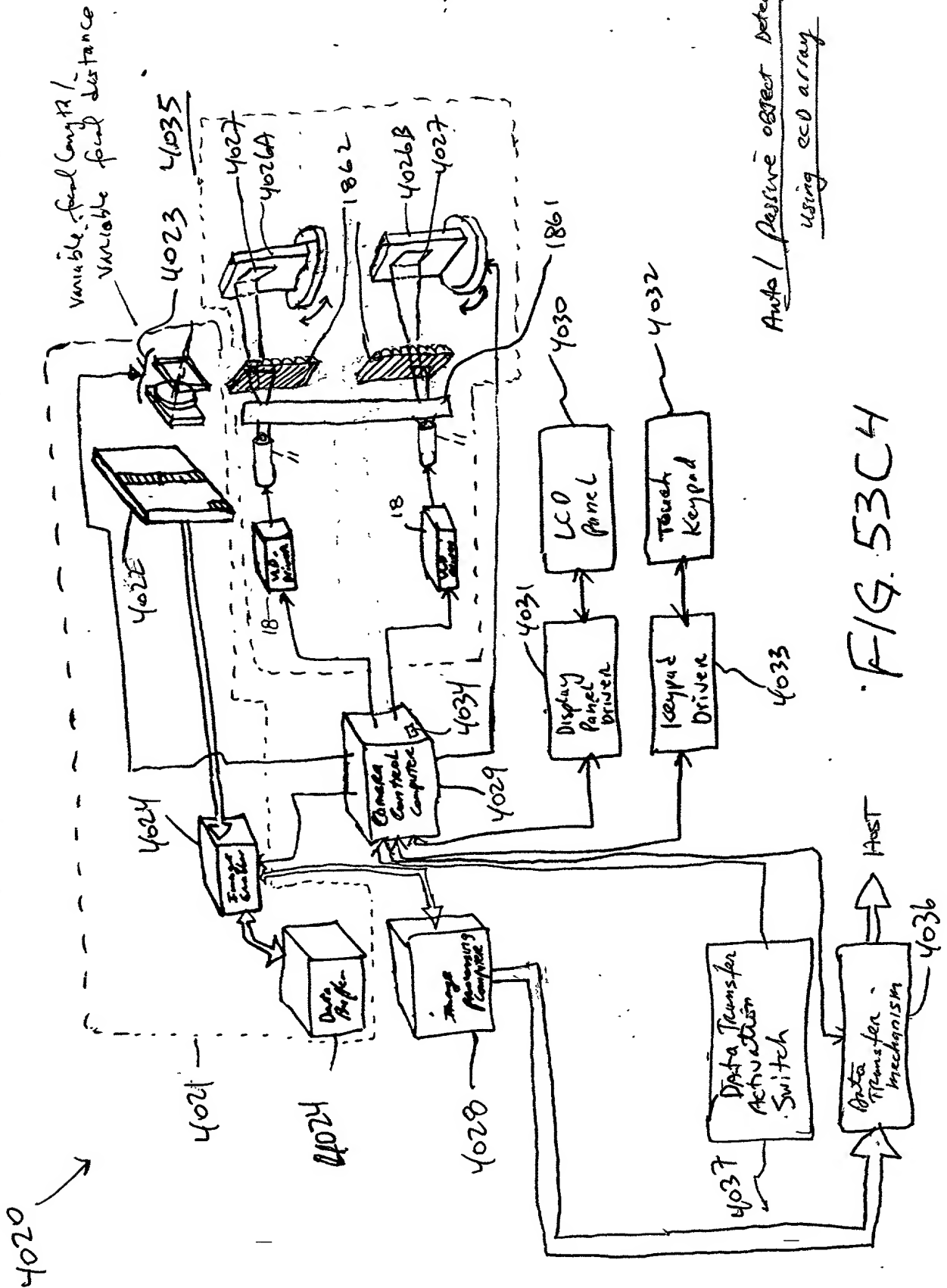
Manual

FIG. 53C1



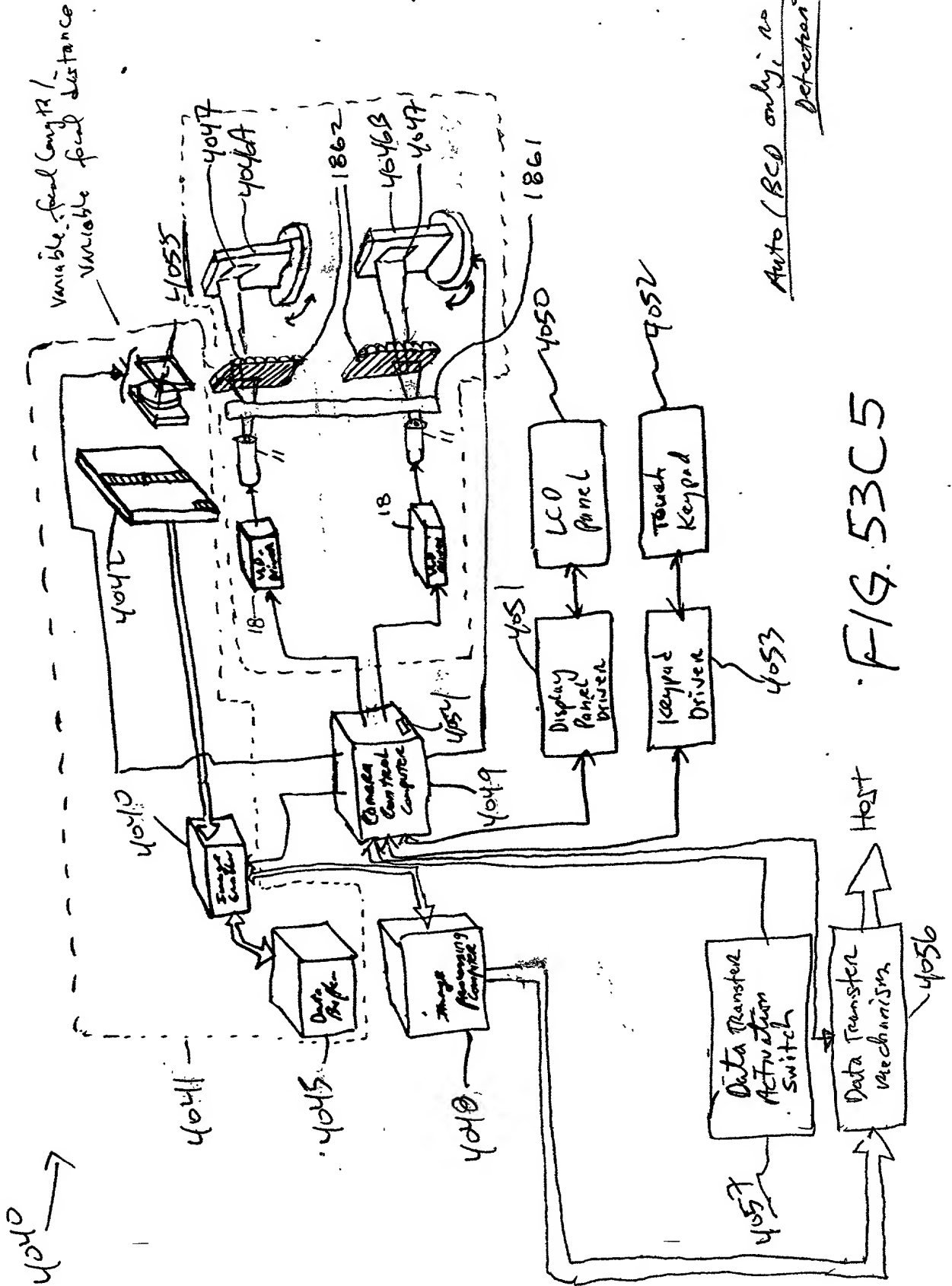
Auto / Laser Object Detection

FIG. 53C3



Auto / Passive object detection
using CCD array

FIG. 53C4



Auto / BCD only; no object
Detection

FIG. 53C5

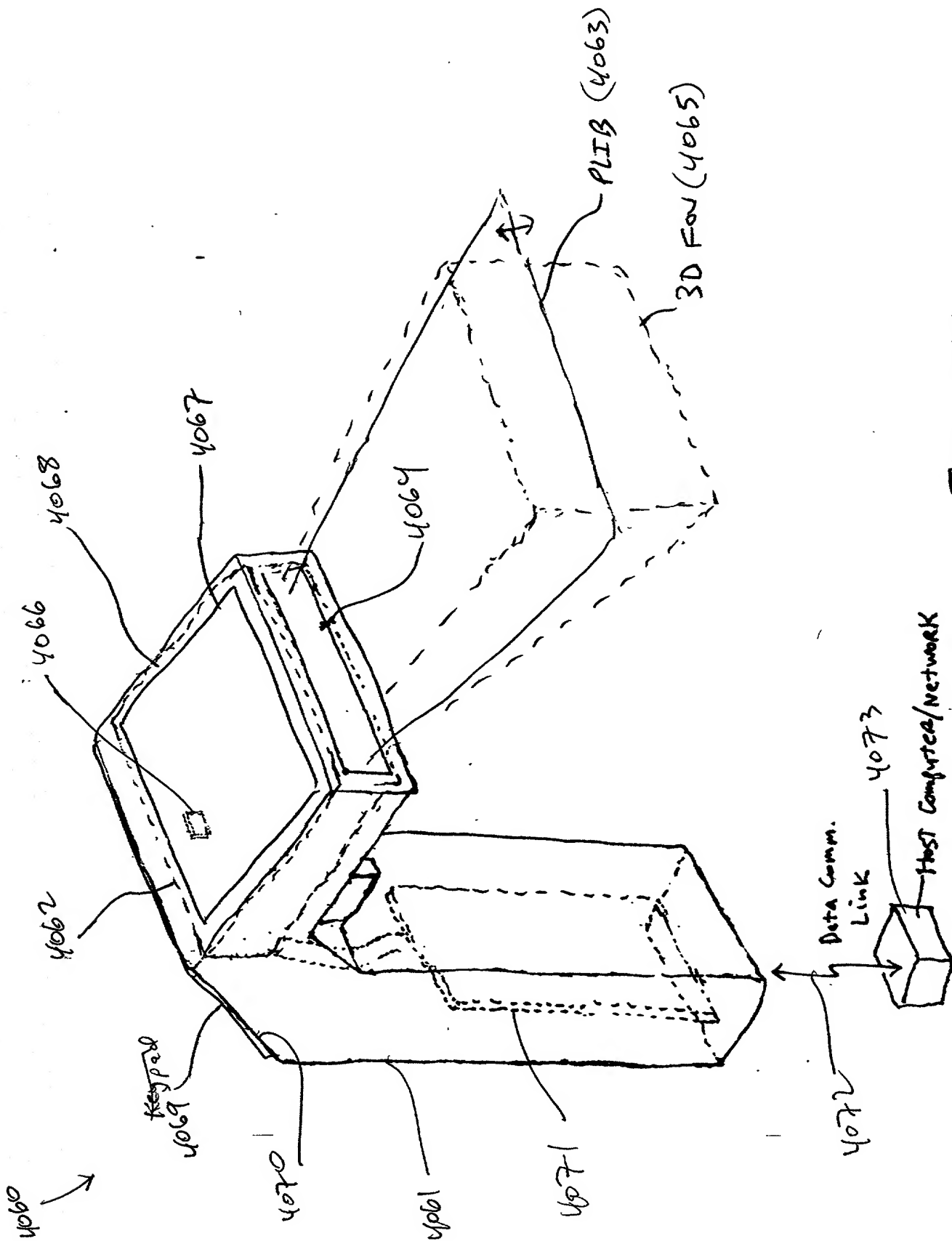


FIG. 54A

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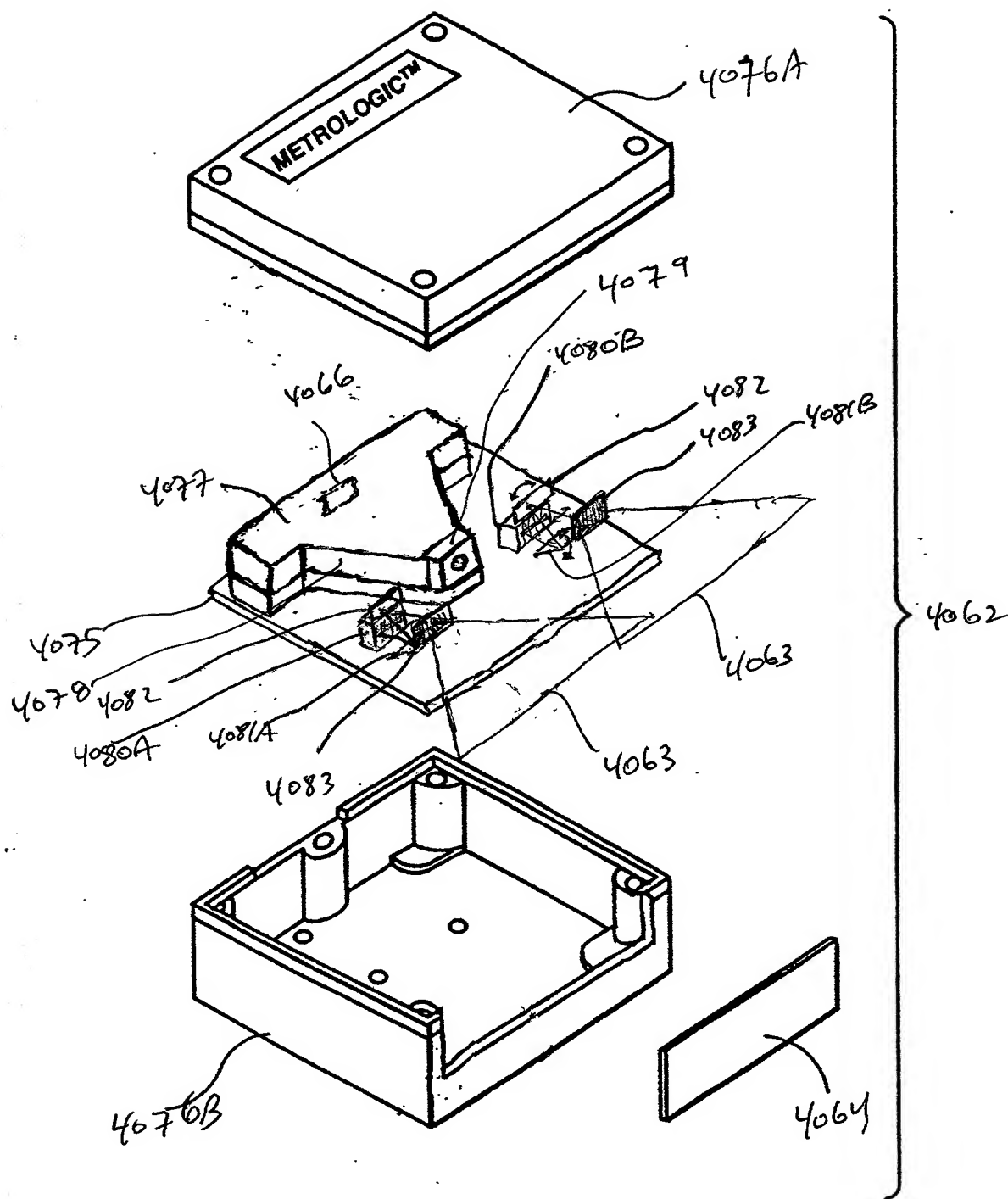


FIG. 54B

(Dual mirrors)

Fig. 175A-SP1

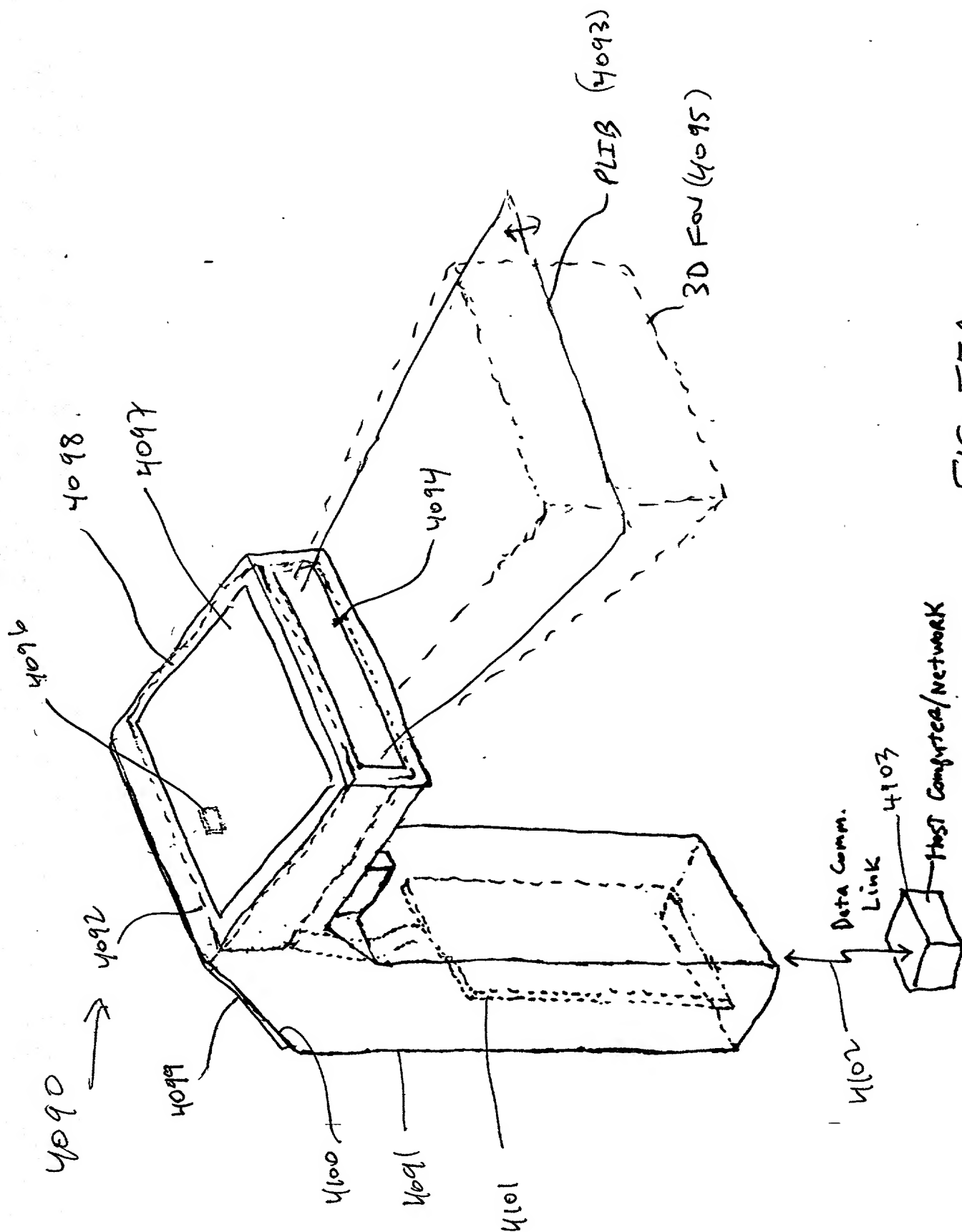


FIG. 55A

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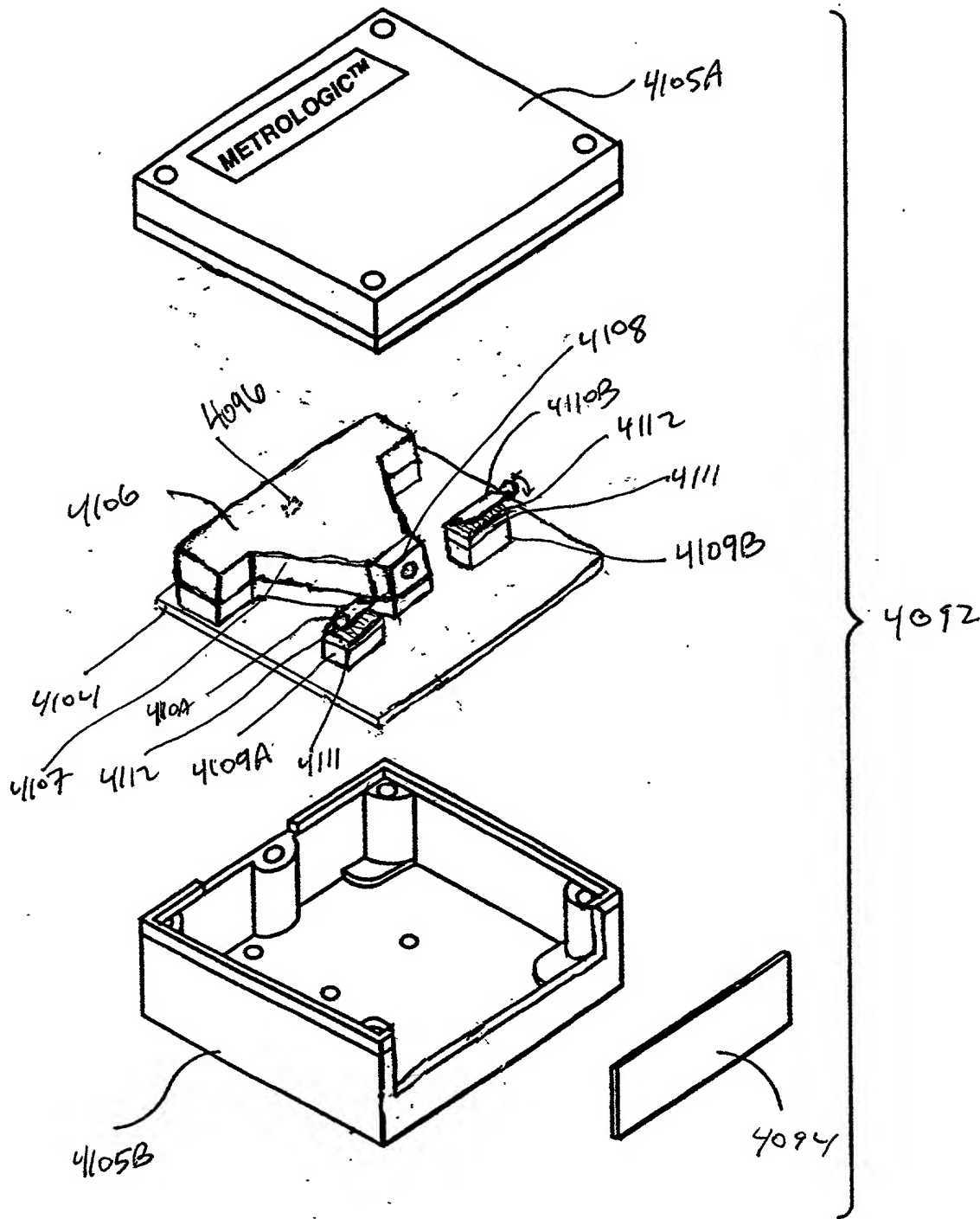


FIG. 55B

Brooks cell
Fig 126A-6B

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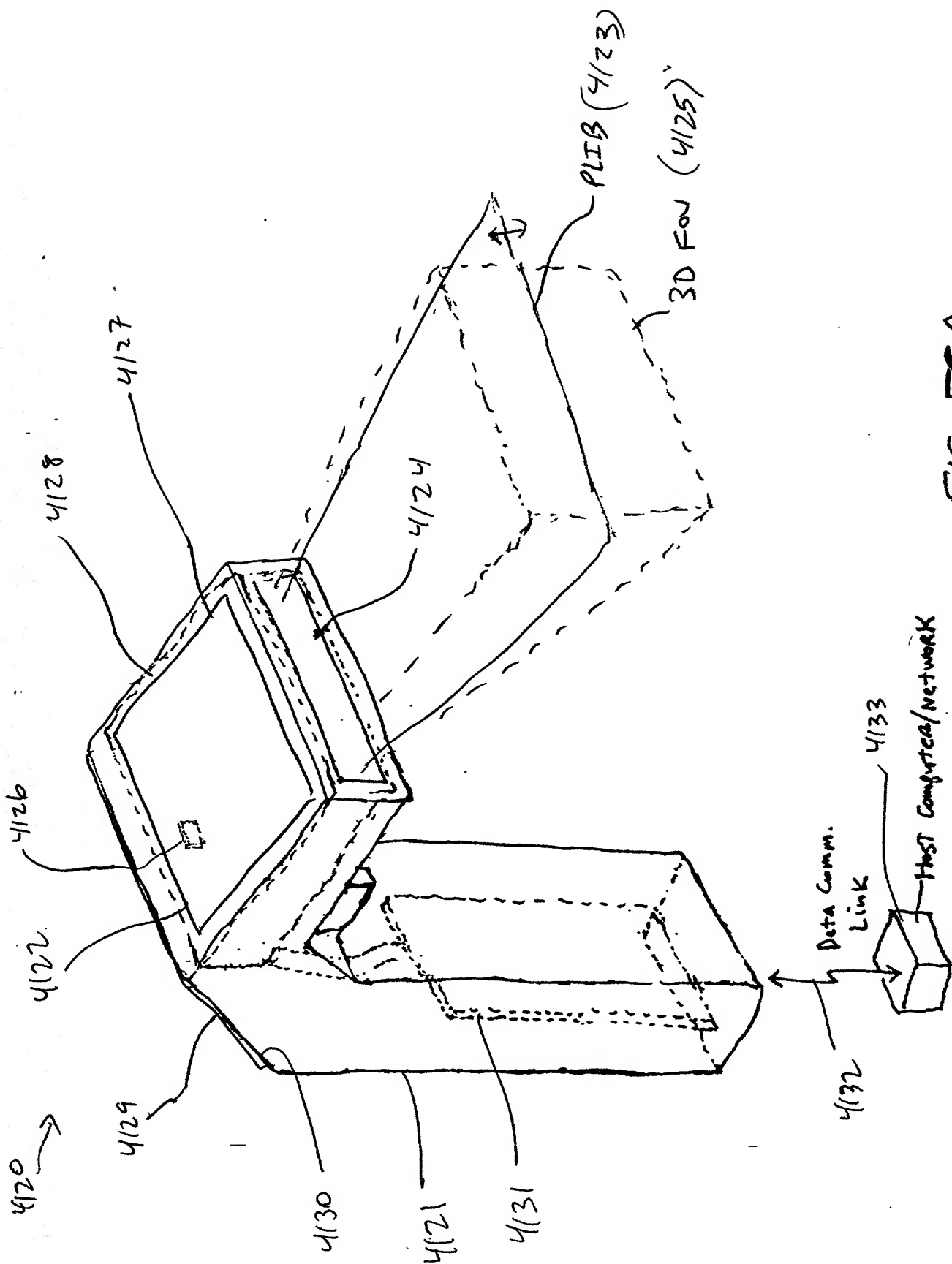


FIG. 56A

227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199

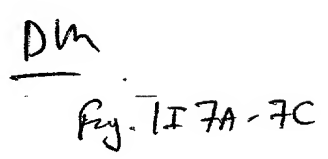


FIG. 56B

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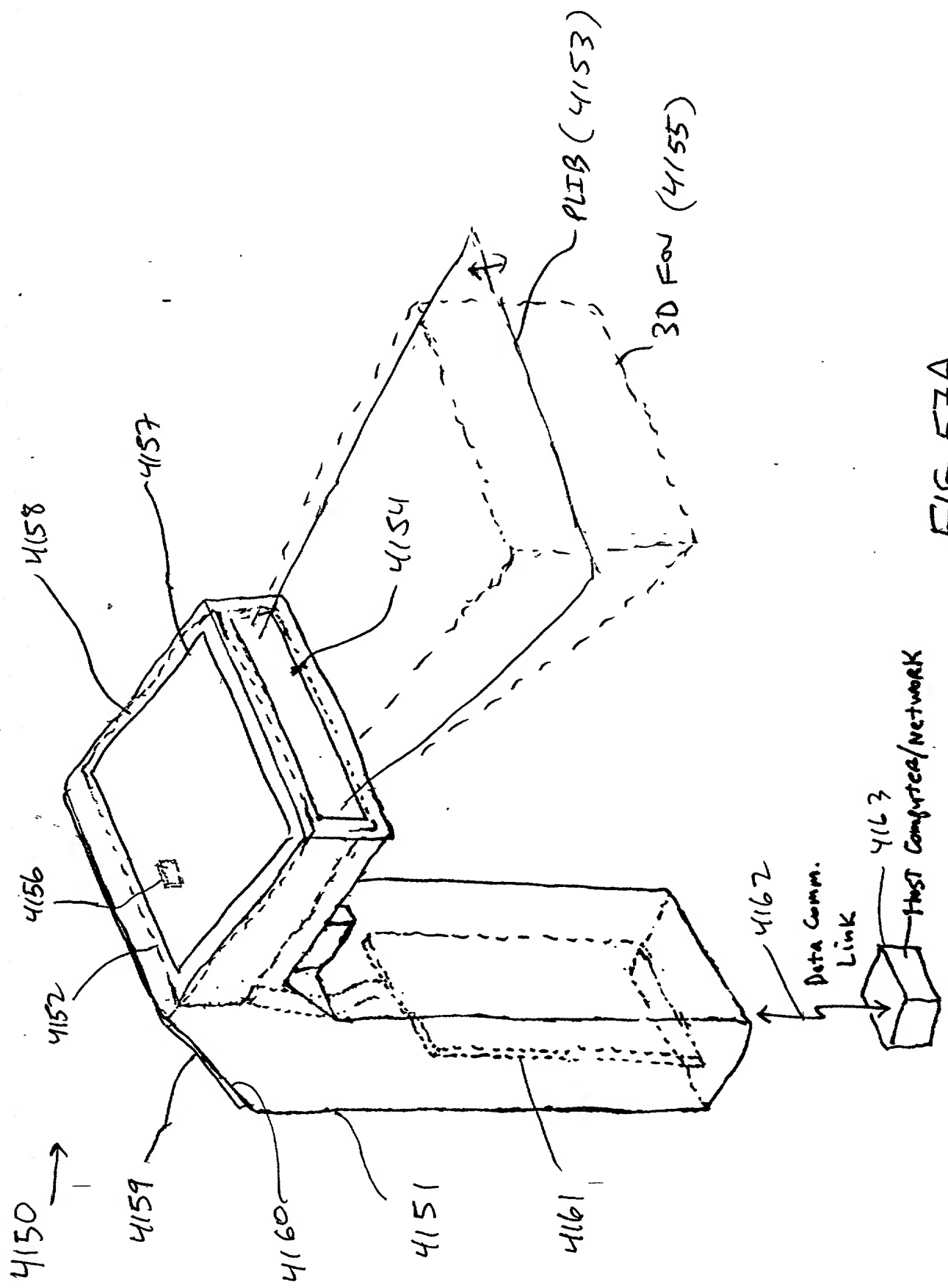


FIG. 57A

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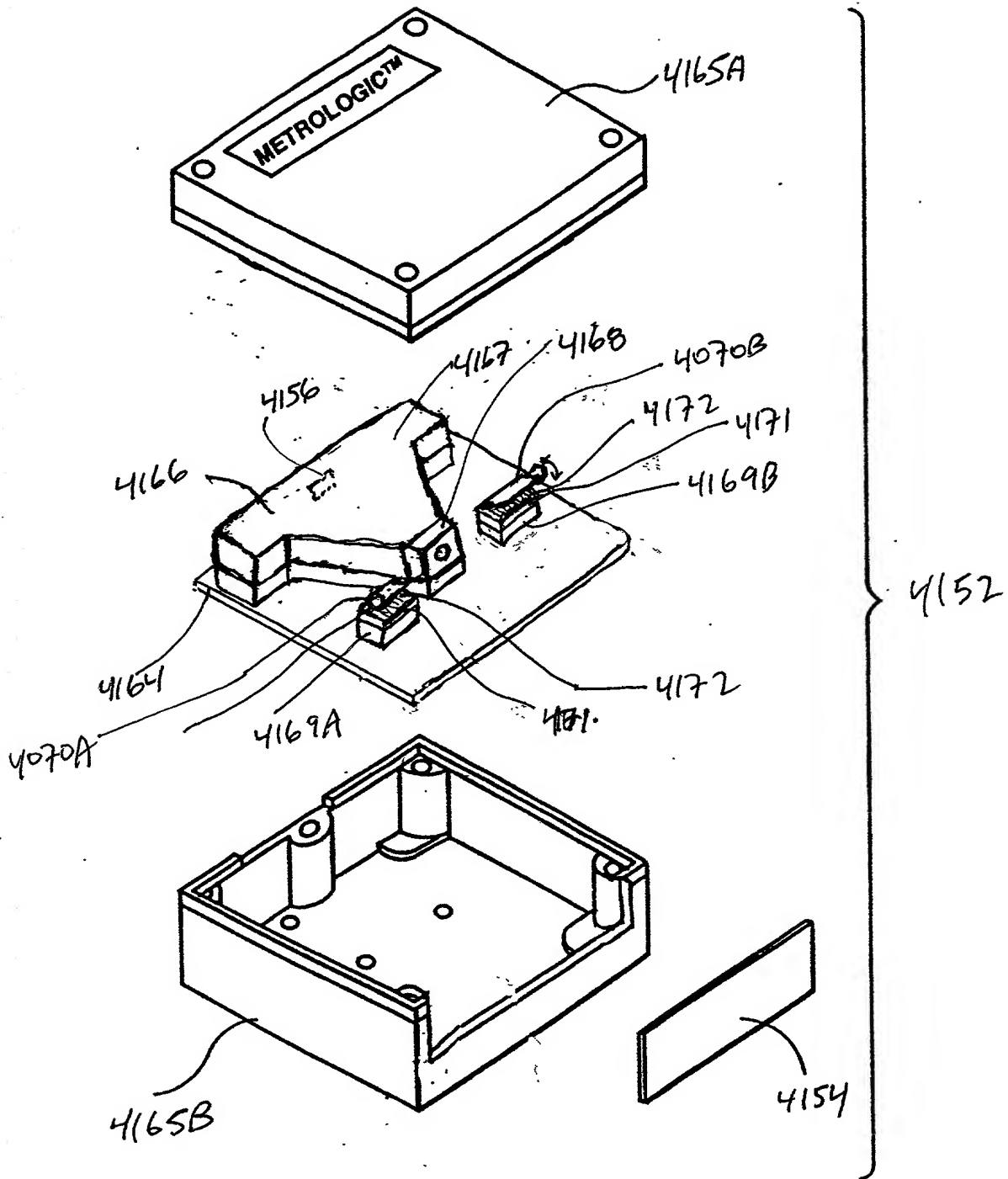


FIG. 57B -

Phase only Lcd
Pm panel

Fys 178F-86

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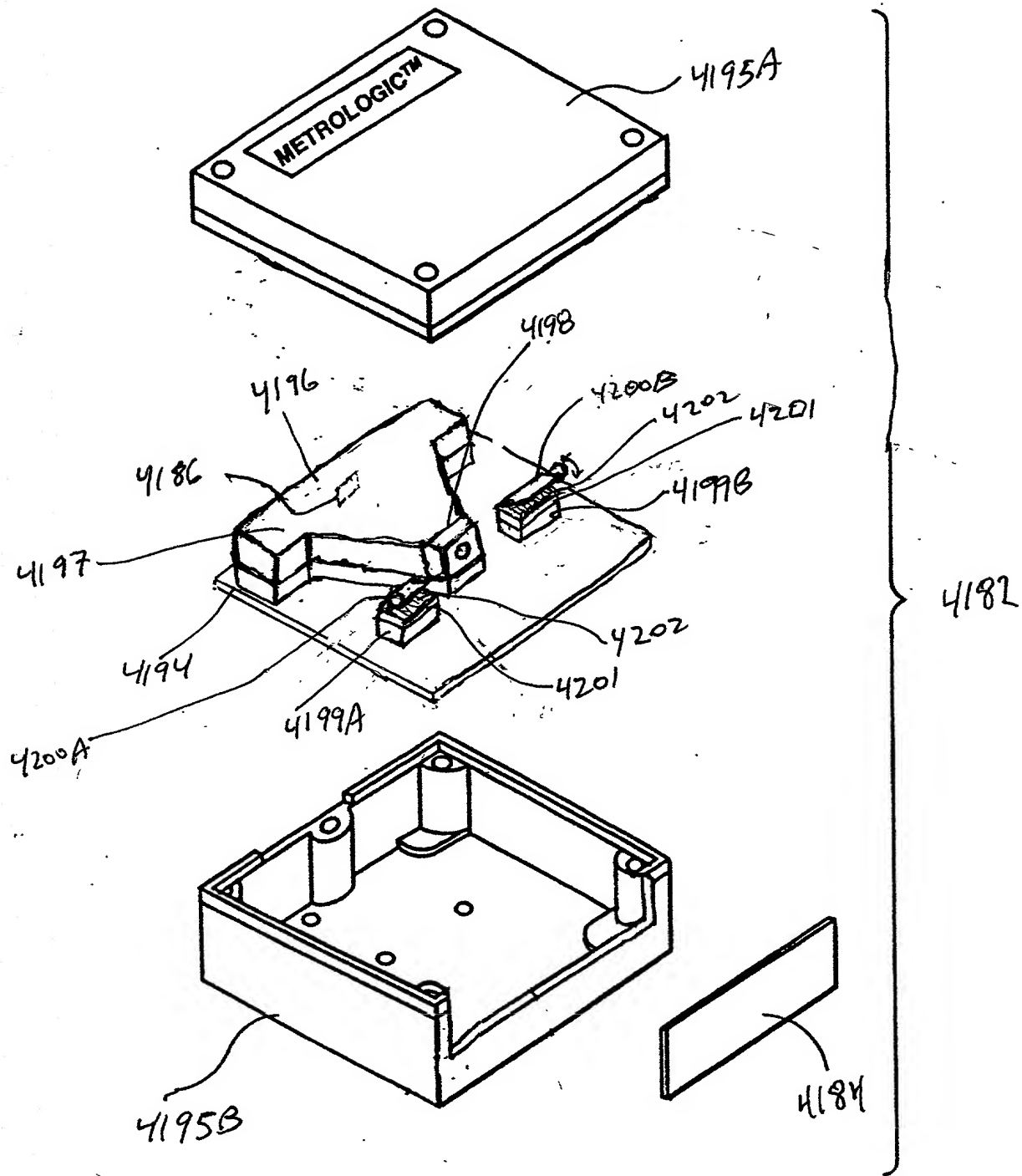
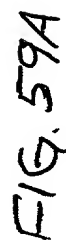


FIG. 58B

HS optical shutter

Fig. 1714A-14B



2009020-2009000T

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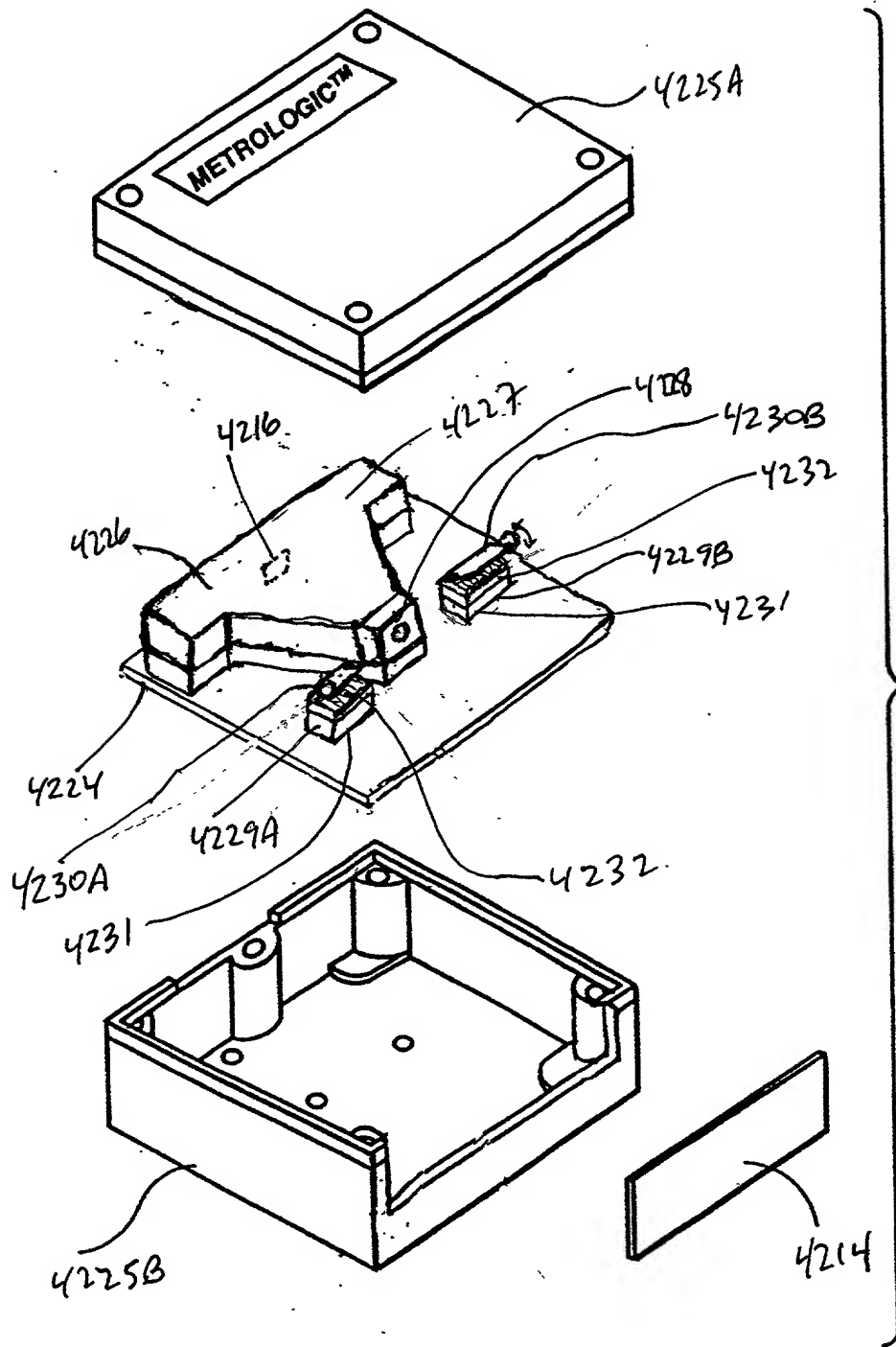


FIG. 59B

INCLD.
Fig. 15A-15B

10058803-020602

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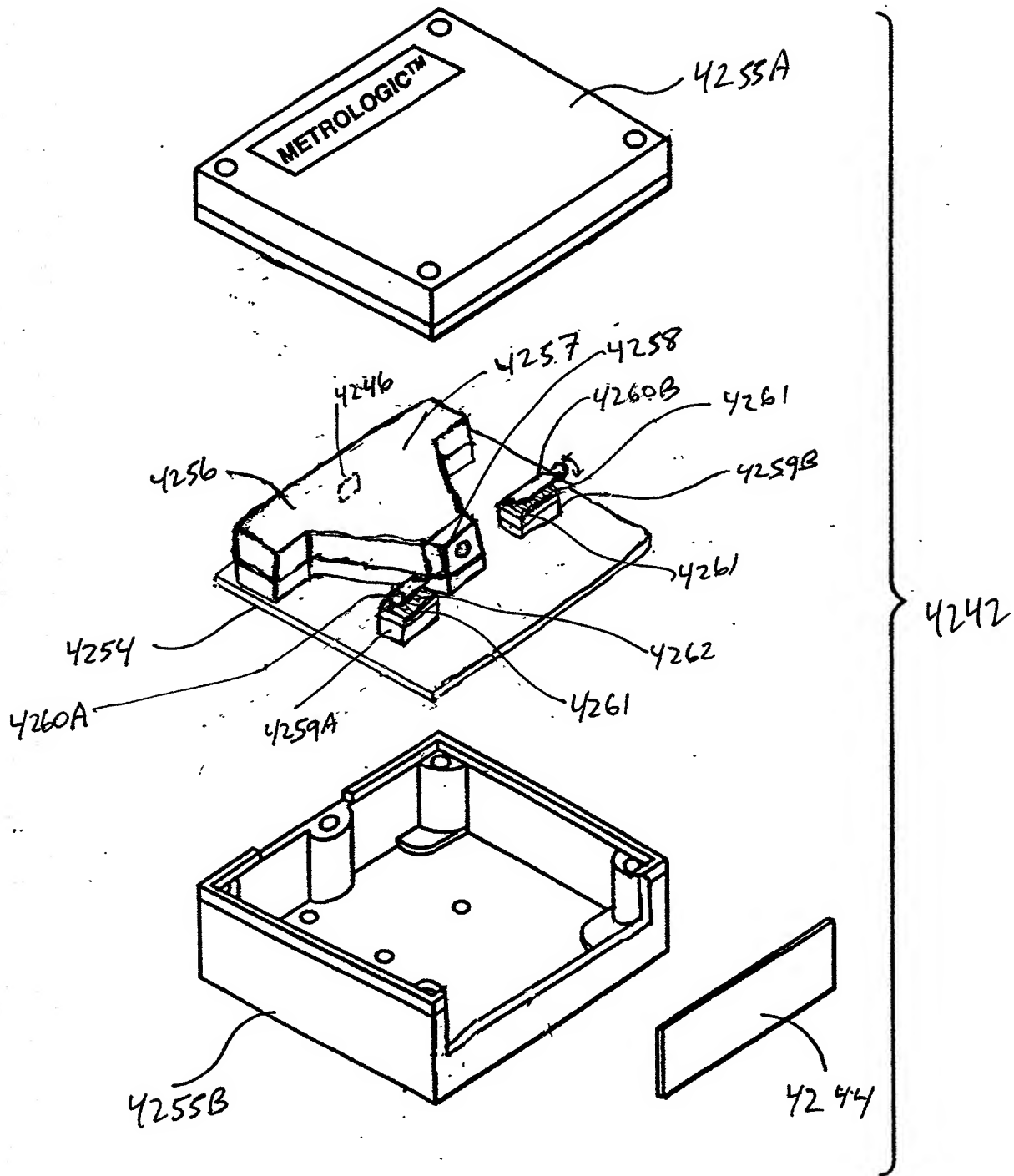


FIG. 60B

Bifalon (Temp. phase mod.)
Fig. 117A-17B

20990210" E0888900T

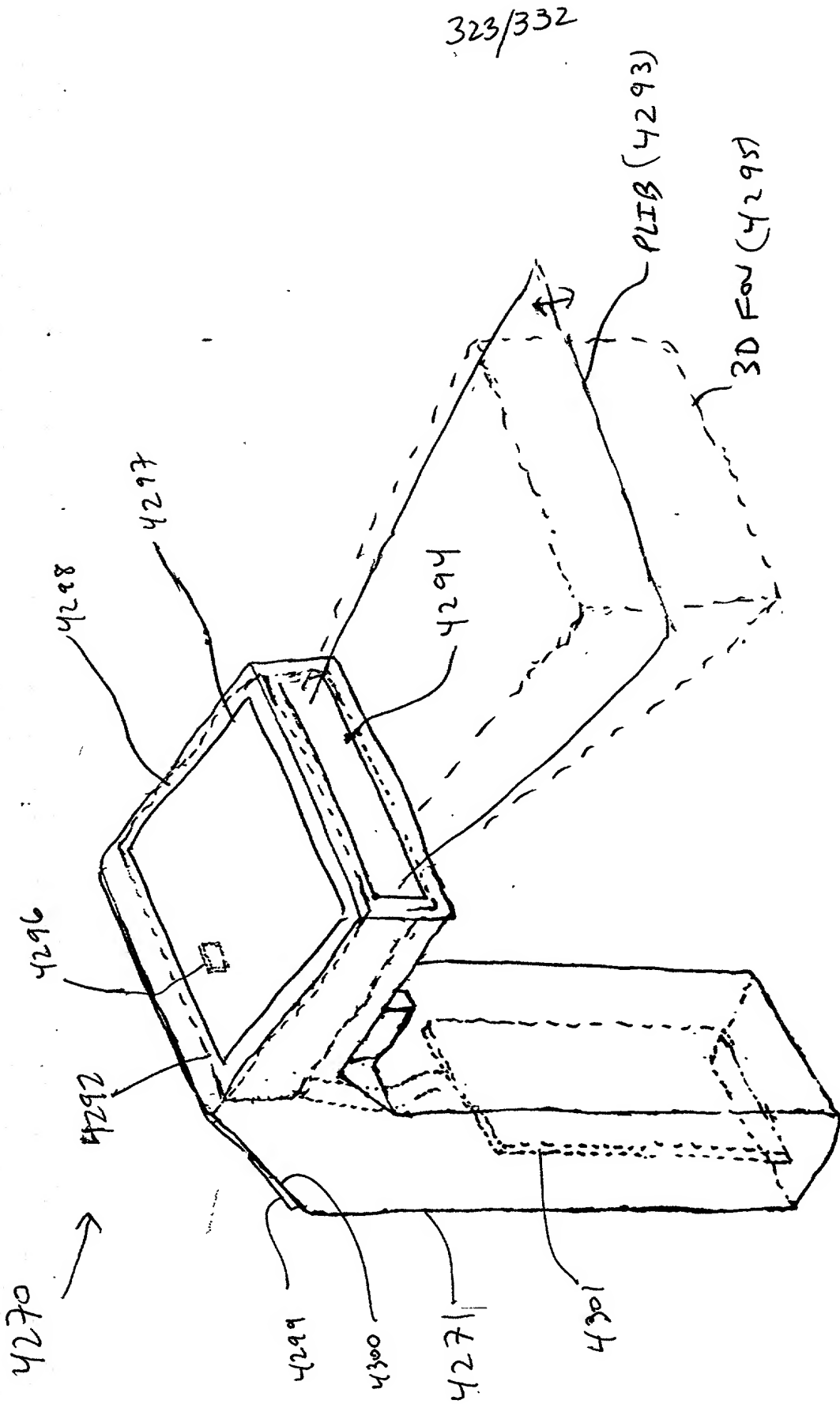


FIG. 6/A

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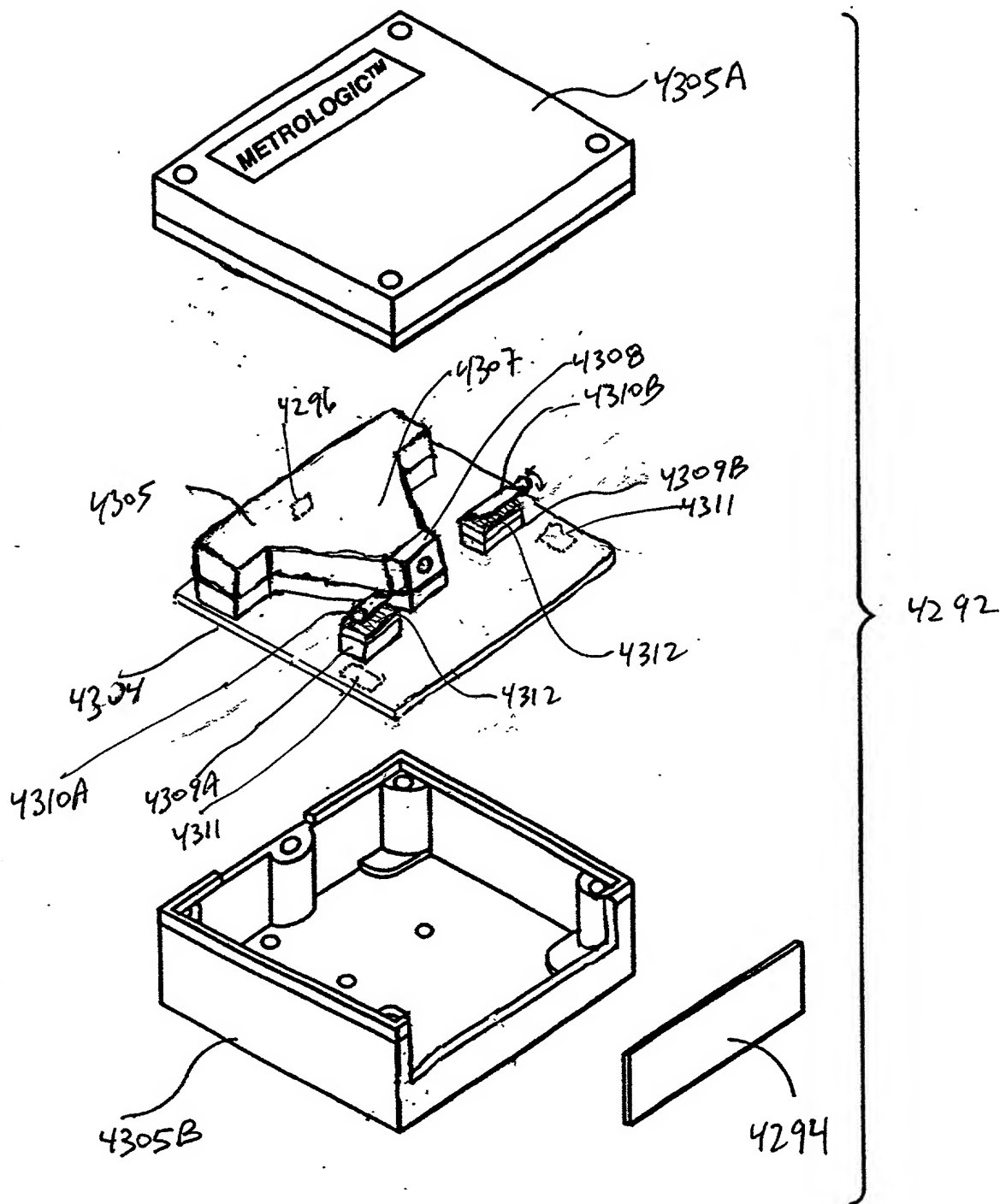


FIG. 61B

mod. hopping

Fig. 1A-19B

2009020" 60889001

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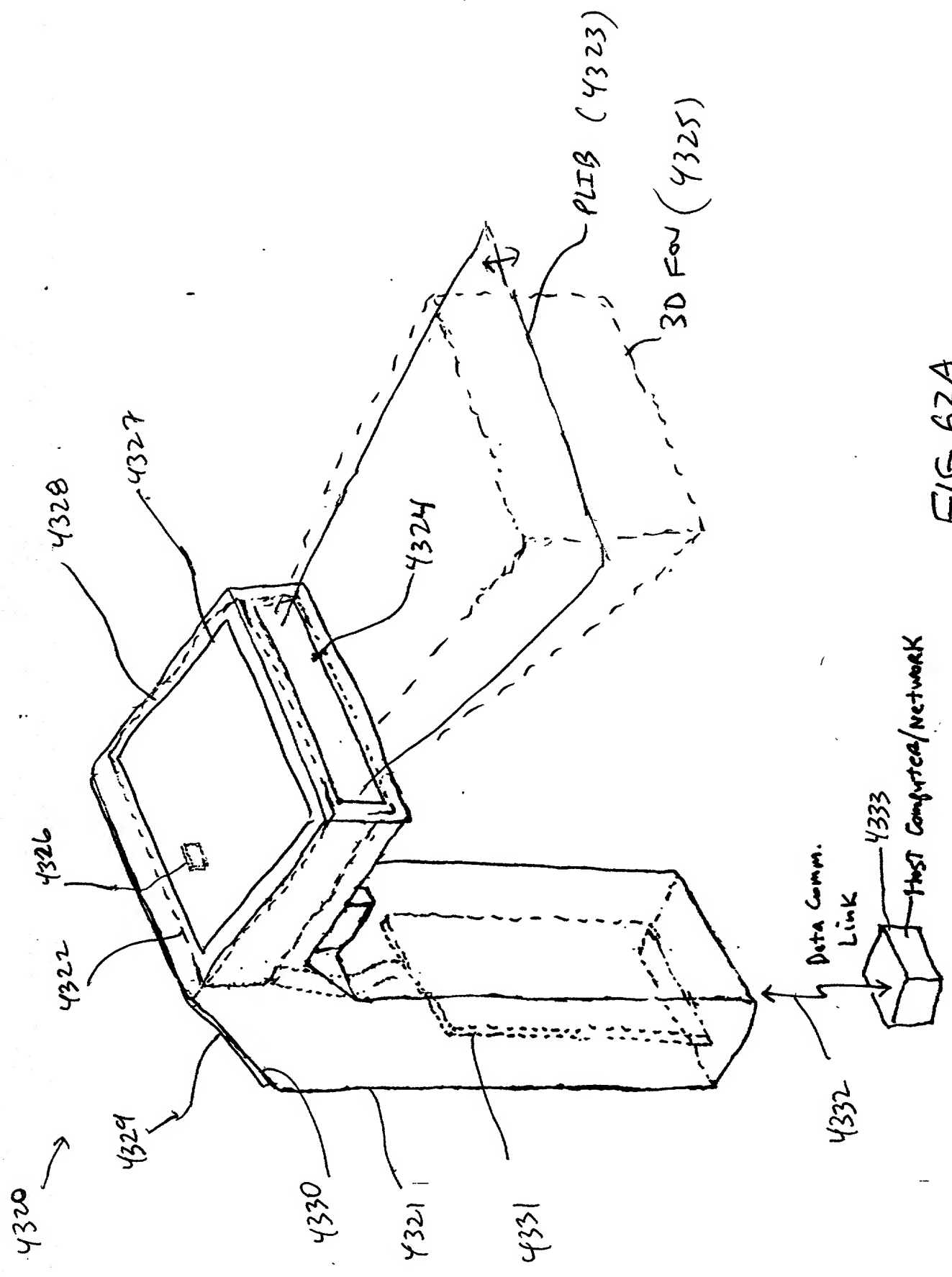


FIG. 62A

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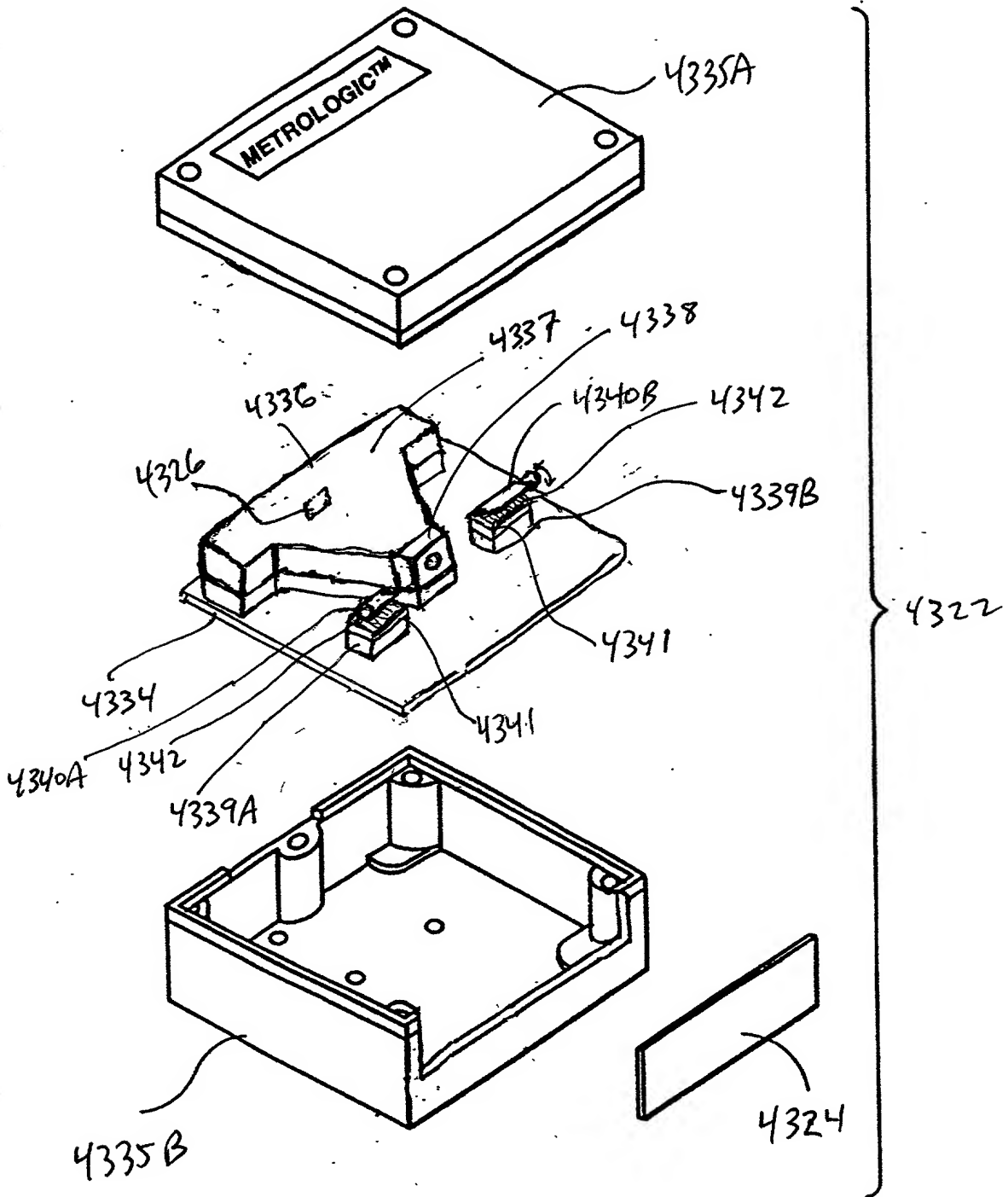


FIG. 62B

measuring
spot intensity
mod. panel

Fig. 1F21A-21D

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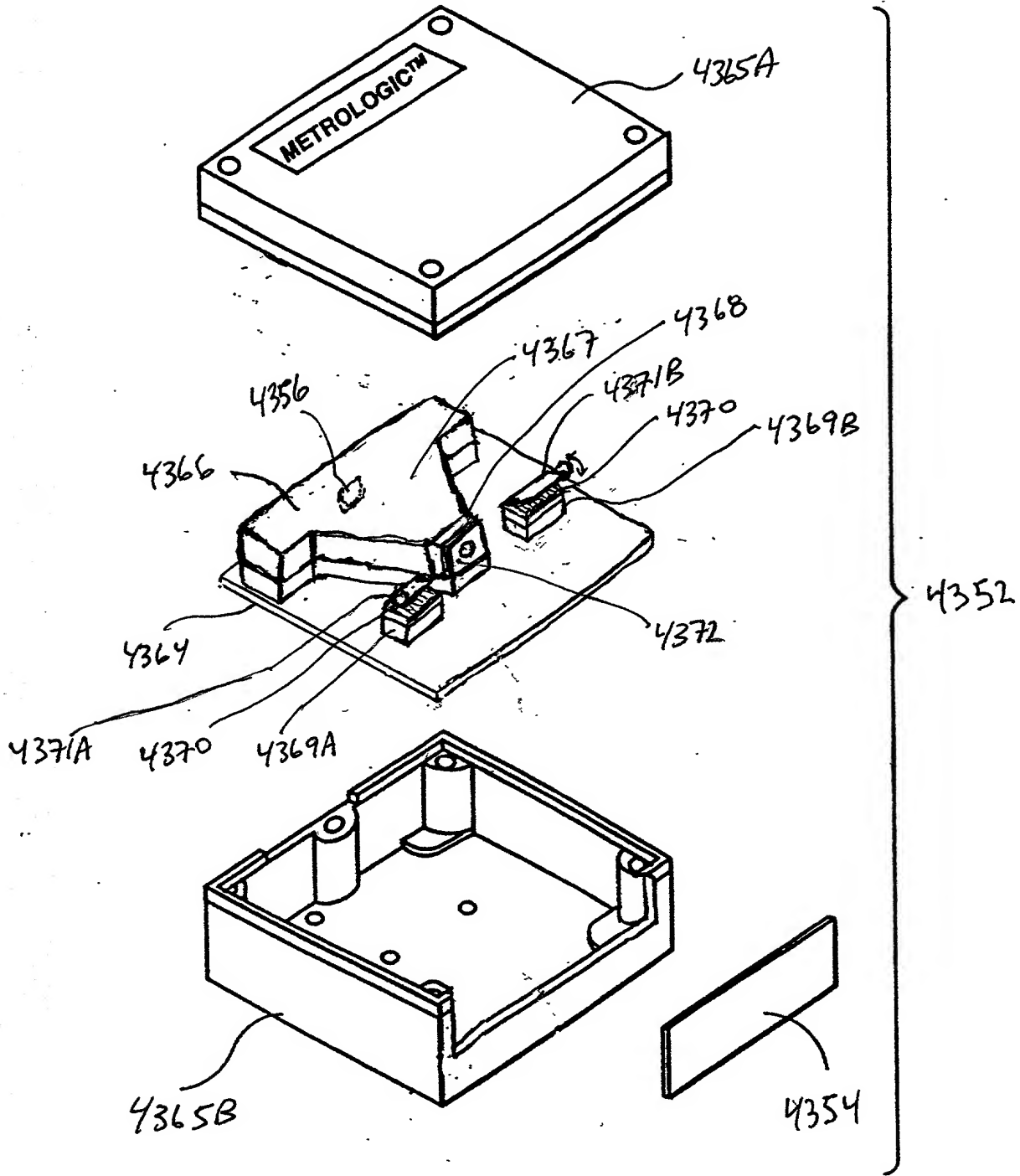


FIG. 63B

Ed of.
mechanical rotating iris

Fig 1^F
23A-23B



FIG. 64A

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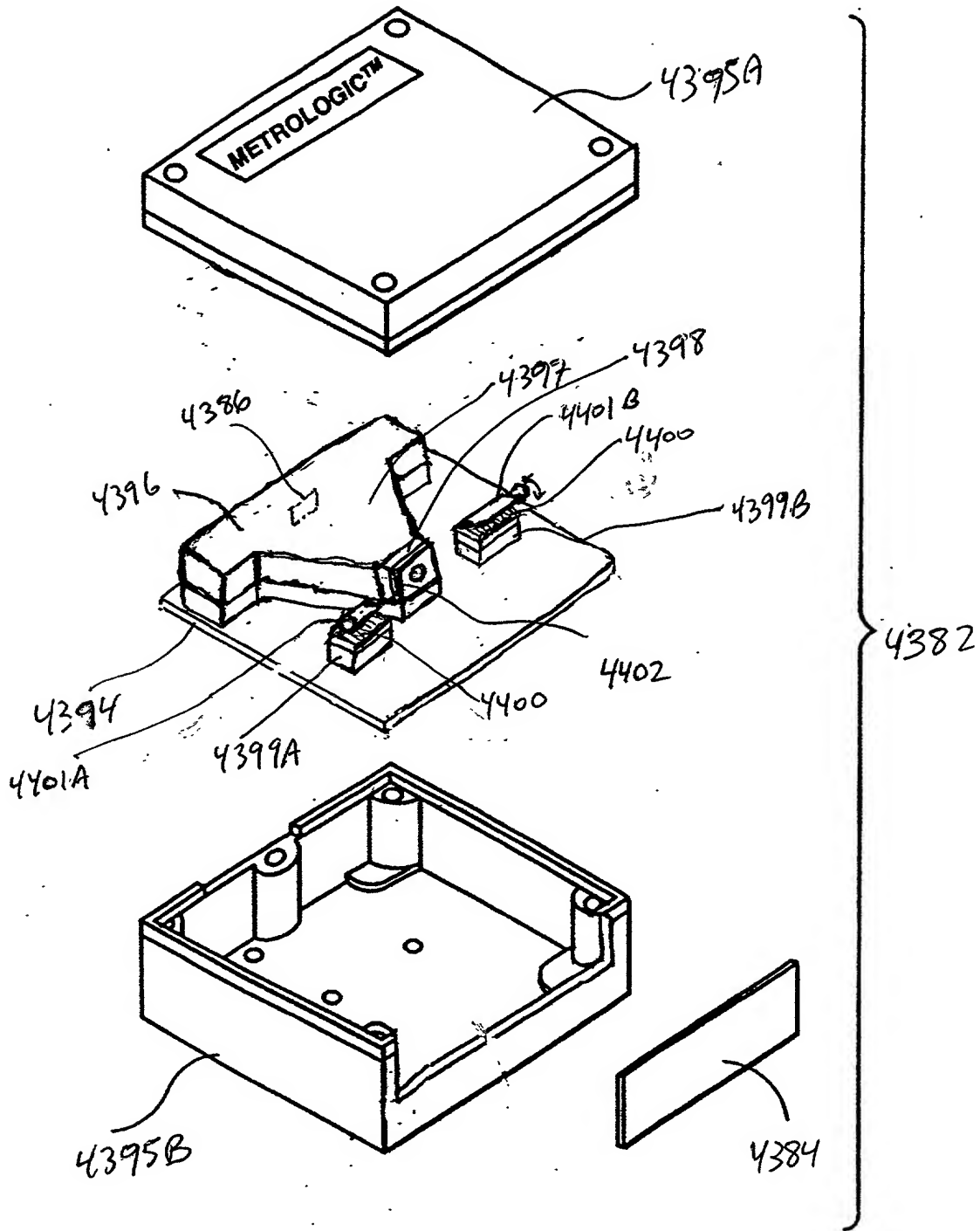


FIG. 64B

* E-optical
Shutter Before
FP Lens
Fig. 1E24A

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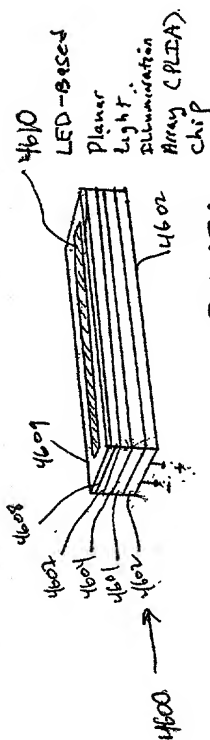


FIG. 67A

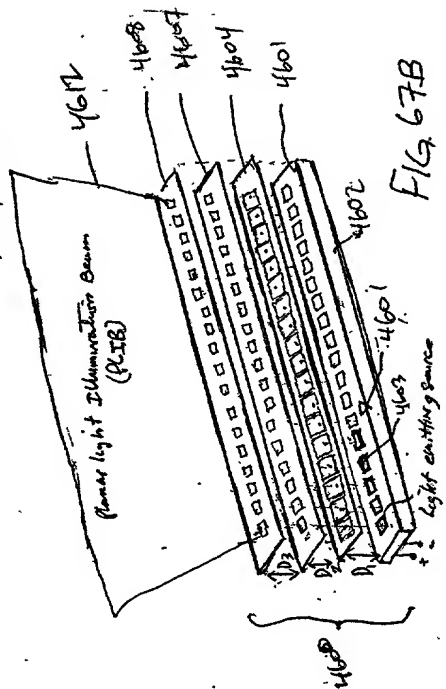


FIG. 67B

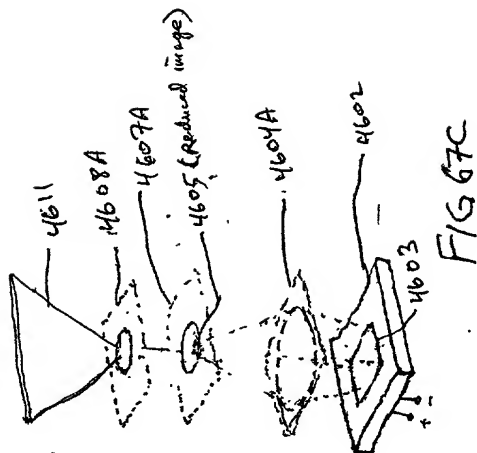


FIG. 67C

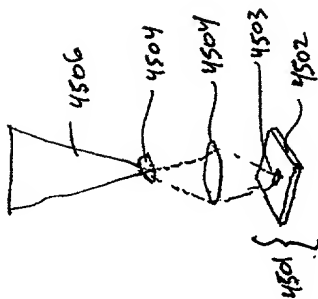


FIG. 65B

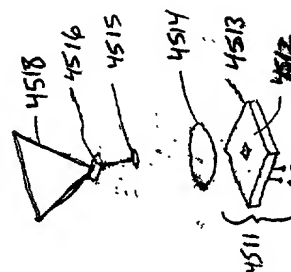


FIG. 66B

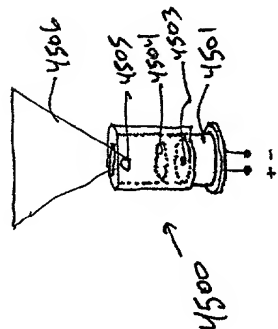


FIG. 65A

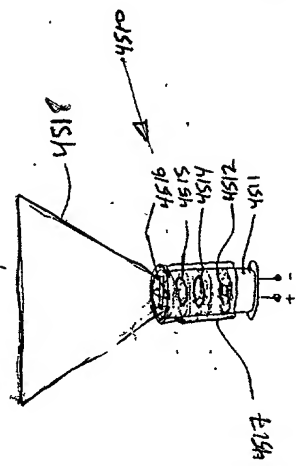


FIG. 66A

Baggage check-in Station #1

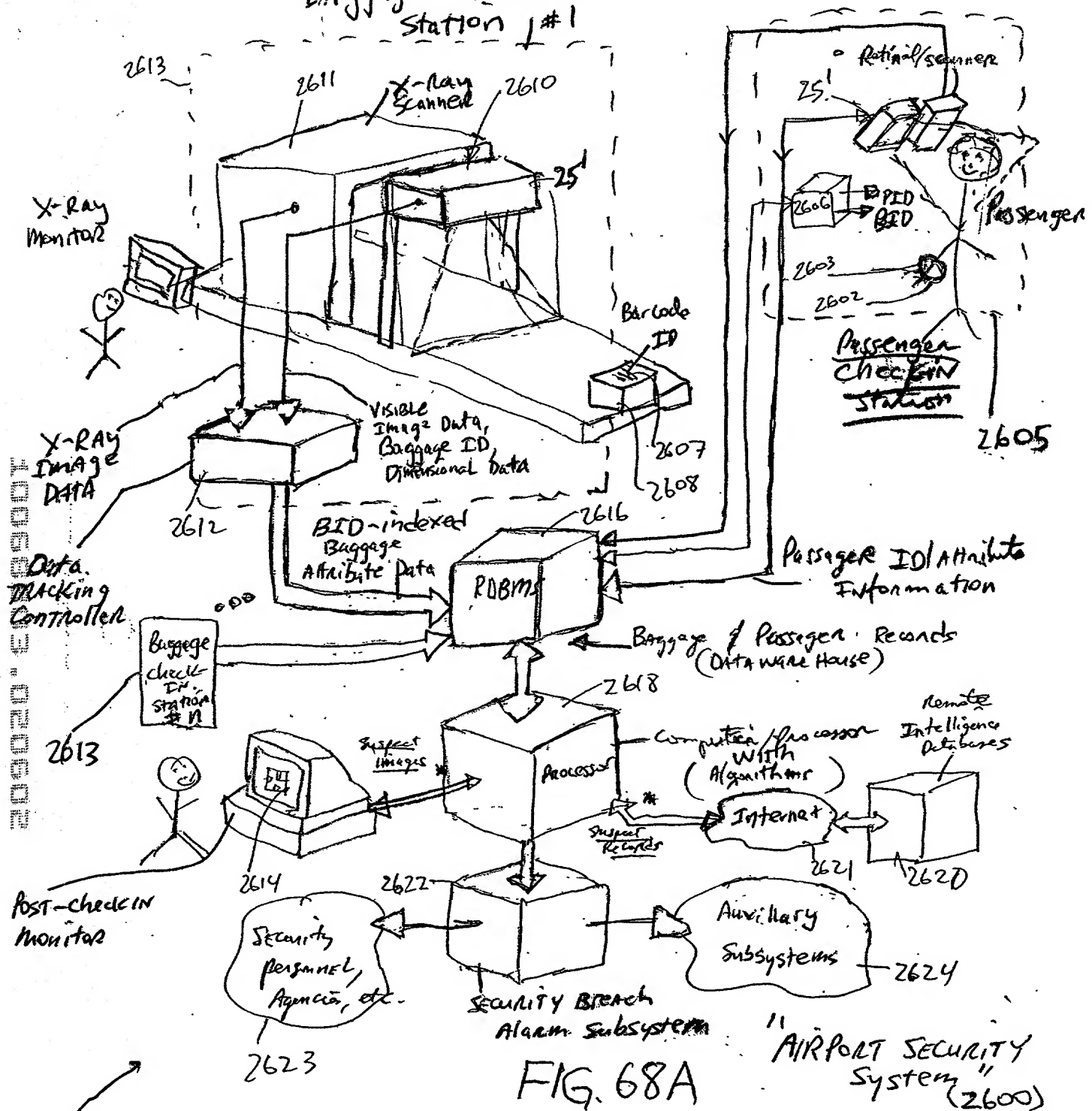


FIG. 68A

RDBMS Record X

Attribute data		2621
Passenger ID #		2620
Baggage ID #		2622
Baggage ID #		2622

FIG. 68B